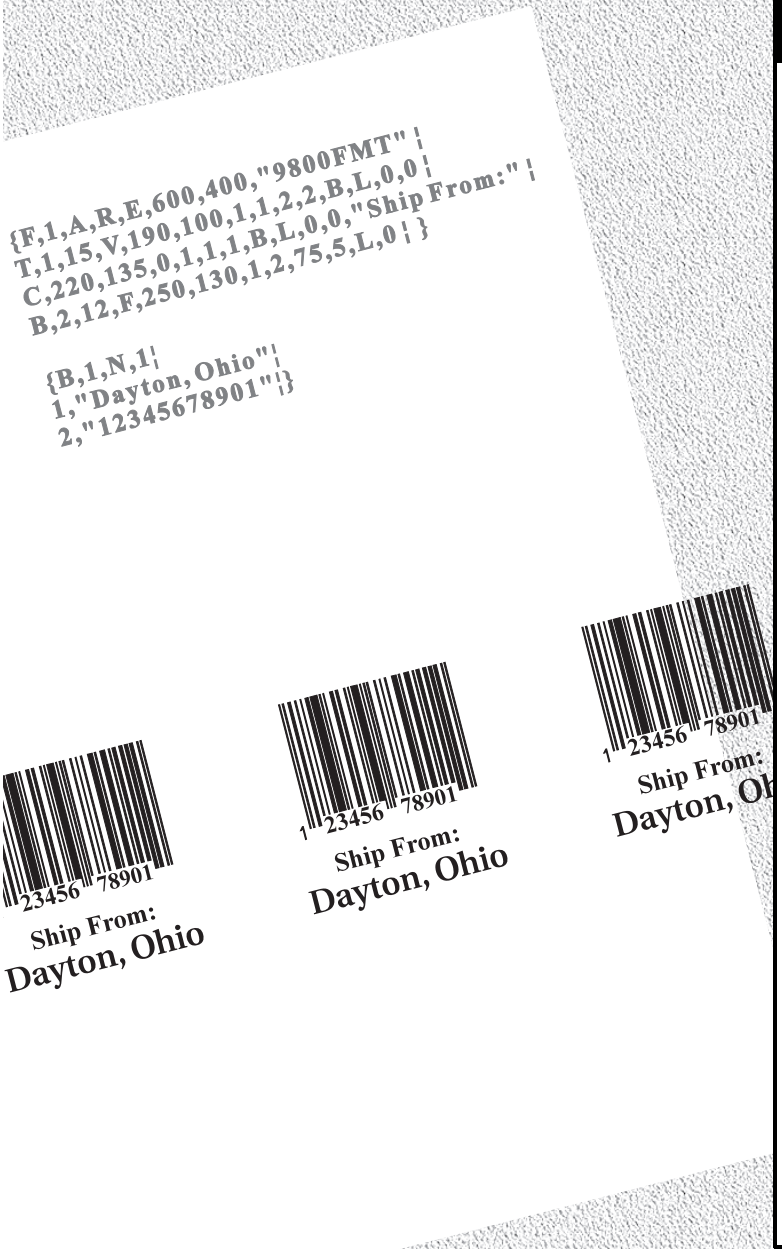
Packet Reference Manual

MONARCH®
DOS-based
PATHFINDER® Ultra®
System



Monarch®
PAXAR

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GETTING STARTED

1

Before you read this manual, review the printer information in the *Equipment Manual*.

About This Manual

This manual is for the developer creating the application for the printer.

You must develop an application that uses the packets you create. Refer to the *Programmer Manual* for information about developing an application.

Use this manual to design and print your own custom formats on the Monarch® 6035™ printer. This chapter creates a sample MPCLII packet.

Standard Features

The following features are standard on the 6035 printer: 192 dots per inch (DPI) printhead, 2 inch by 4 inch maximum print image, 1.8 inches per second (IPS) maximum print speed, baud rate up to 115K, center-justified printing, 4-line display, alphanumeric keypad, scanner, and 1 Meg memory with an additional 2 Meg flash ROM.

Creating an MPCLII Format Packet

A *format* defines which fields appear and where the fields are printed on the label. The printer requires this information in a special form, using Monarch® Printer Control Language II (MPCL). This section describes how to create a sample MPCLII format packet.

Make sure supplies are loaded, you have a fully charged battery, and you have an application in the printer. Refer your *Equipment Manual* for more information.

For detailed information about the format header, text, constant text, and bar code fields, see Chapter 3, "Defining Fields." For information about batch packets, see Chapter 5, "Printing."

1. Type the following format header, in any text editor:

   {F,25,A,R,M,508,508,"FMT-25" ¦

2. Type the following constant text field:

   C,250,80,0,1,1,1,W,C,0,0,"MONARCH MARKING:",0 ¦

3. Type the following bar code field:

   B,1,12,F,110,115,1,2,120,5,L,0 ¦

4. Type the following text field:

   T,2,18,V,30,30,1,1,1,1,B,C,0,0,0 ¦ **}**

You have created a format packet for your MPCLII printer. Now, a batch packet must be created before you can print the format.

5. Type the following batch header, after the text field line:

   {B,25,N,1 ¦

6. Type the following bar code data:

   1,"12345678901" ¦

7. Type the following text field data:

   2,"DAYTON, OHIO" ¦ **}**

8. Save your file as SAMPLE.FMT.

For your application to use the format, use the PCL library functions in the *Programmer Manual*.

Using MPCLII Conventions

Here are some guidelines to follow when using MPCLII.

MPCLII Punctuation

Use the following symbols when creating MPCLII packets:

{	start of header
}	end of header
¦	field separator. Depending on the character set you are using, this character may appear differently, but it should always be hex 7C.
,	parameter separator
"ABC"	Quotation marks enclose character strings. Empty quotes ("") identify null strings or unused fields.
‘comment‘	Grave accents enclose comments. Any data enclosed in grave accents is ignored. Do not embed comments within a quoted string. Grave accents are also used to reject mainframe data.

These MPCL characters are the default.

Standard Syntax Guidelines

When creating MPCLII packets:

- Begin each packet with a **start of header** (**{**).
- End each packet with an **end of header** (**}**).
- Define no more than **50** fields in a format. Each ¦ indicates one field. However, options are not counted as fields.
- The field number (**0** to **999**) must be unique. Monarch recommends starting at 1, instead of 0.
- Do not use a field number more than once per format.
- Define all fields in the order you want to image/print them.
- Separate all parameters with a **Parameter Separator** (**,**).
- End each field with a **Field Separator** (¦).
- Enter all information in CAPITAL letters, except words or phrases within quotation marks.
- Include all parameters for a field unless documented as optional.
- Define non-printable text fields before the field to which they apply.
- Define options immediately after the field to which they apply.
- Multiple options can be used with most fields. Options can be used in any combination except as noted with each definition.
- Keep in mind that proportionally spaced fonts need wider fields than monospaced fonts. For variable field data, use a letter "W" to determine the maximum field size.
- Do not place a new line (return) or any other non-printing character in a character string. However, a carriage return or line break after each ¦ makes your formats easier to read.
  T,1,20,V,30,30,1,1,1,1,B,C,0,0,0¦
  T,2,10,V,50,30,1,1,1,1,B,C,0,0,0¦
- Spaces are ignored, except within character strings.

DESIGNING A FORMAT

2

This chapter describes how to

- determine what kind of information to use in your format.
- use the Supply Layout Grid and Format Worksheet.
- categorize data into field types.
- select fonts to use in your format.

Starting with a Design

Before you create a format packet, you must design your label. There are several steps to designing a custom label:

1. Decide which fields should appear on your label. See "Determining Format Contents" for more information.
2. Determine your label size. Labels are available from Monarch in a wide variety of sizes. Your application and the amount of data you need to print determines the supply size. Contact Monarch Marking for more information.
3. Draw a rough sketch of your label. You may want to draw several variations to see what works best. See "Drawing Rough Sketches" for more information.
4. Identify the field types that appear on your label. See "Considering Field Types" for more information.
5. Decide which fonts you want to use. See "Considering Fonts" for more information.
6. Fill out your Format Worksheet. See "Using the Format Worksheet" for more information.

At this point, you are ready to use your format.

7. Create a format packet, based on how you filled out your worksheet. See Chapter 3, "Defining Fields," for more information.
8. For your application to use the format, use the PCL library functions in the *Programmer Manual*.
9. Execute your application.

Determining Format Contents

Before you lay out your format, you need to make a few decisions. For example:

- How large is your supply?
- Which fonts do you want to use?
- Do you want to include a bar code?
- Do you want to include graphics?

Determining the Print Area

The print area varies, depending on the size of your supply. Below are the maximum and minimum print areas. Notice that the top edge of the supply exits the printer first.

Unit of Measure	Maximum Supply Size	Maximum Print Area	Minimum Supply Size	Minimum Print Area
English (1/100")	200 x 400	183 x 365	120 x 55	109 x 46
Metric (1/10mm)	508 x 1016	465 x 927	305 x 140	277 x 117
Dots (1/203 dots)	384 x 768	352 x 701	230 x 106	208 x 88

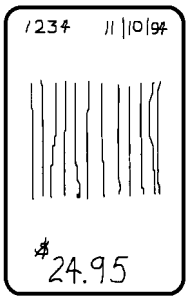
For exact print area measurements of your supply, see the supply layout grids in Appendix D.

Use the following formulas to convert inches to dots and metric:

```
Dots = inches x 192
Metric (1/10mm) = inches x 254
English (1/100 inch) = 100 x (dots/192)
Dots = Metric (1/10 mm) x 756/1000
```

Drawing Rough Sketches

After you decide what information you want to print, sketch how you want the information to appear on the label. Note any areas that are preprinted on the label, such as a logo.



As soon as you know what information to include on the label, and you have a rough sketch, you can use a supply layout grid to help you layout and size your label. If you do not want to use a grid, go to "Considering Field Types" to choose what information you want on your label.

Using Supply Layout Grids

A supply layout grid contains measurement markers. These markers help you accurately position information on your label.

Decide whether you want to design formats using English, Metric, or Dot measurements. Choose from the following grids:

- English

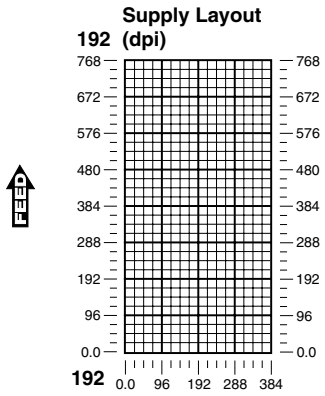
  The English grid is measured in 1/100 inches.

- Metric

  The Metric grid is measured in 1/10 millimeters (mm).

- Graphic

  The printer uses dots to print images on a label. The printhead has 192 dots per inch (DPI).



If you want to use supply layout grids, a copy of each is in Appendix D, "Format Design Tools."

Considering Field Types

After you select a supply size, the next step in designing a format is to decide what information you want to print on the label. For example, you may want to print your company name, price of an item, and a bar code that combines information from other places. Everything you want to print falls into one of the following categories.

Field Type	Description	Examples
Text	Contains letters, numbers, or symbols you want to print.	item number, item description, department number, price, date
Bar Code	Used for printing bar codes that can be scanned.	item or serial numbers, zip codes, information you don't want to have visible to customers
Constant Text	Prints fixed characters that print without changing.	company name, company address
Line or Box	Highlights or separates items.	line marking out the regular price, border around the supply
Graphic	Contains a bitmap image or a compliance label overlay.	logos

All of the above field types except graphics are discussed in Chapter 3. See Chapter 6, "Creating Graphics" for information on including graphics in your format.

Considering Fonts

When working with fonts, you have three considerations:

- font appearance
- font size (bitmapped)
- font spacing (monospaced or proportional)

See Appendix B, "Fonts," for samples of each font.

Using the Format Worksheet

The Format Worksheet is divided into sections that list the field types. Each section has boxes to fill in with parameters that define your format. A format worksheet is included in Appendix D, "Format Design Tools."

Filling in the Format Worksheet

Decide what type of field to use on your label.

1. Make a copy of the Format Worksheet.
2. Define the Format Header.
3. Define options as you require them. See Chapter 4, "Defining Field Options" for more information.

DEFINING FIELDS

3

This chapter provides a reference for defining

- the format header
- text and constant text
- bar code fields
- line and box fields.

Defining the Format Header

A Format Header begins a format file.

Syntax **{F,format#,action,device,measure,length, width,"name"** ¦

F1. F Format Header.

F2. format# Unique number from **0-999** to identify the format.

F3. action Enter **A** to add a new format to the printer.

F4. device Format storage device. **R** is the only valid value.

F5. measure Unit of measure. Options:

E English, measured in 1/100 inches
M Metric, measured in 1/10 mm
G Graphic, measured in dots

F6. length Supply length, top to bottom, in selected units.

English	**55 - 400**
Metric	**140 - 1016**
Dots	**106 - 768**

F7. width Supply width, from left to right, in selected units.

English	**120 - 200**
Metric	**305 - 508**
Dots	**230 - 384**

F8. "name" Format name (optional), **0-8** characters, enclose within quotation marks.

Example: **{F,1,A,R,E,300,200,"TEXTILES"** ¦

Format 1 ("TEXTILES") uses a three inch long by two inch wide label.

Defining Text Fields

Create a separate definition for each text field. If text falls on two lines, each line of text requires a separate definition.

Syntax T,field#,# of char,fix/var,row,column, gap,font,hgt mag,wid mag,color,alignment, char rot,field rot,sym set ¦

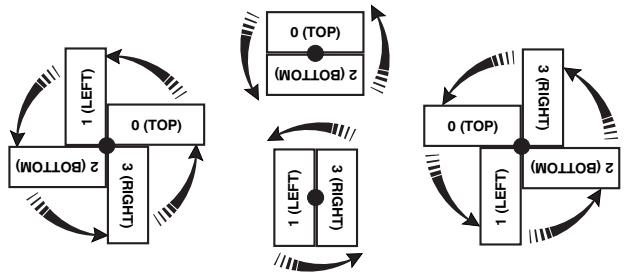
T1. T Text Field.

T2. field# Unique number from **0-99** to identify this field.

T3. # of char Maximum number of printed characters (**0-2710**) in the field.

T4. fix/var Fixed or variable length field. Options:
F Fixed length
V Variable length

T5. row For monospaced fonts, distance from bottom of print area to the pivot point. The pivot point varies depending on how text is justified.



Left/Center/Right-Justified **Balanced** **End-Justified**

For proportionally spaced fonts, distance from bottom of print area to baseline of characters in field.

English	**0 - 365**
Metric	**0 - 927**
Dot	**0 - 701**

T6. column

Distance from the left edge of the print area to the pivot point to find the column location.

English	**0 - 183**
Metric	**0 - 465**
Dots	**0 - 352**

T7. gap

Number of dots between characters (192 dots per inch). Range: **0-99**.

NOTE: For monospaced fonts, the additional spacing is added to the existing inter-character gap. This is also true for proportionally spaced fonts, but remember that the inter-character gap varies with character combinations.

Any number other than **0** or the default number affects your field width. Default spacing:

Letter Gothic Bold 6pt.	**1 dot**
Letter Gothic Bold 9pt.	**2 dots**
Reduced	**1 dot**
All other fonts	**varies with each letter**

T8. font

Style of font. Options:

CG Trium Bold		CG Trium Bold Cond	
1000	6.5 pt	**1006**	6.5 pt
1001	8 pt	**1007**	8 pt
1002	10 pt	**1008**	10 pt
1003	12 pt	**1009**	12 pt
1004	18 pt	**1010**	18 pt
1005	22 pt	**1011**	22 pt

Letter Gothic Bold		Reduced	
1012	6 pt	**2**	Internal Font
1013	9 pt		

NOTE: Point sizes greater than 12 include only the following special characters:
0123456789#$%&(),./@DFKLMPS\kprö¢£¥.
All other point sizes use the whole symbol set. This information may not apply to optional fonts.

T9. hgt mag Height magnifier, **1-7** (times). Use a magnifier of **1** with proportionally spaced fonts, because characters lose smoothness at higher magnifications.

T10. wid mag Width magnifier, **1-7** (times). Proportionally spaced fonts do not have a set width. To estimate the size of your field, use the letter "W" for the widest field or an "L" for an average width field. Find your selected font and the desired width in Appendix B, "Fonts."

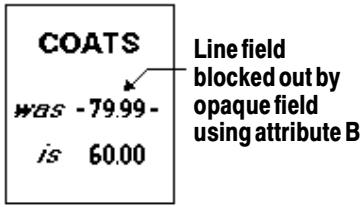
T11. color Options for standard printer fonts:

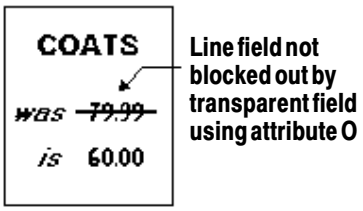
B Opaque, Normal, Black, Normal
D Opaque, Normal, White, Normal
O Transparent, Normal, Black, Normal
R Transparent, Normal, White, Normal
W Opaque, Normal, White, Normal

NOTE: Solid black print should not exceed 30% on a given square inch of the label, or the printhead life may be decreased.

There are two types of field color overlay attributes:

Transparent The overlay field (text or constant text) does not block out (or "erase") existing fields.
Opaque The overlay field blocks out (or "erases") existing fields.





Field placement in the packet is an important consideration when using field color attributes. If a line field is defined before the overlay (text or constant text) field, the line field is blocked out by the overlay field, depending on the overlay field's color attribute. If a line field is defined after the overlay field, the line field is not blocked out by the overlay field, regardless of the overlay field's color attribute.

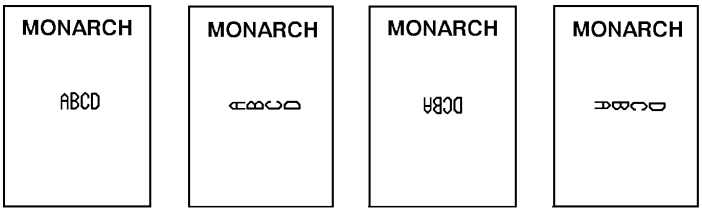
T12. alignment Options:

L Align on left side of field.
C Center text within field (monospaced fonts only)
R Align on right side of field (monospaced fonts only)
B Align at midpoint of field
E Align at endpoint of the field

Use **L**, **B**, or **E** for any font.

T13. char rot Character rotation. The field or supply does not rotate, only the characters do. Options:

0 Top of character points to top of field
1 Top of character points to left of field
2 Top of character points to bottom of field
3 Top of character points to right of field



T14. field rot Field rotation. Field rotation rotates the whole field, not just the characters. Rotation is affected by the pivot point, which varies depending on how text is justified. Lower left corner of field is the pivot point. Options:

0 Top of field points to top of supply
1 Top of field points to left of supply
2 Top of field points to bottom of supply
3 Top of field points to right of supply

T15. sym set Symbol set. Use **1** (ASCII Symbol Set)

See Appendix C, "Symbol Sets/ Code Pages" for more information.

Example: **`T,2,10,V,250,50,0,1,1,1,B,C,0,0,0`** ¦

Defines a text field (field #2) with a variable length of up to 10 characters. The field begins at row 250, column 50. There is no additional gap between characters, and the Standard font is used without any additional magnification. The printing is black on white and centered. No field or character rotation is used. The internal symbol set is used.

Defining Bar Code Fields

Each bar code field requires a separate definition.

Syntax

```
B,field#,# of char,fix/var,row,column,
font,density,height,text,alignment,
field rot ¦
```

B1. B Bar Code Field.

B2. field# Unique number from **0-99** to identify this field.

B3. # of char Maximum number of characters. If the bar code uses a check digit, allow an extra character for the check digit. The actual maximum number of characters is limited by the size of the label and bar code density. Range: **0-2710**.

B4. fix/var Fixed (**F**) or variable (**V**) length field.

Bar Code	Number of Characters	Fixed or Variable
UPCA	12	F
UPCA+2	14	F
UPCA+5	17	F
UPCA+Price CD	12	F
UPCE or LAC	7	F
UPCE+2	9	F
UPCE+5	12	F
EAN8	8	F
EAN8+2	10	F
EAN8+5	13	F
EAN13	13	F
EAN13+2	15	F
EAN13+5	18	F
EAN13+Price CD	13	F
Interleaved 2 of 5 or Interleaved I 2 of 5 with Barrier Bar	0 to 2710	F or V
Code 39 or MOD43	0 to 2710	F or V

Bar Code	Number of Characters	Fixed or Variable
Codabar (NW7)	0 to 26	F or V
Code 128	0 to 2710	F or V
Code 93	0 to 2710	V
Code 16K	0 to 2710	V
MSI	0 to 14	F or V
Maxicode	15 to 99	F
PDF417	0 to 2710	F or V
POSTNET	0 to 11	F

B5. row Distance from bottom of the print area to the pivot point of the field. The pivot point varies, depending on how the field is justified. Pivot points:

Left/Center/Right-Justified Fields

Balanced Fields

End-Justified Fields

Remember to include text or numbers that may appear with the bar code for the row measurement.

English **0 - 365**
Metric **0 - 927**
Dots **0 - 701**

B6. column Distance from the lower left edge of the print area to the pivot point.

English **0 - 183**
Metric **0 - 465**
Dots **0 - 352**

NOTE: Allow a minimum of **1**/**10** inch between the scan edge of bar code and label edges or other data. Two-dimensional barcodes cannot be scanned (MaxiCode, PDF417, Code 16K and POSTNET).

B7. font Bar code. Options:

1	UPCA	**14**	EAN8 +2
2	UPCE	**15**	EAN8 +5
3	Interleaved 2 of 5	**16**	EAN13 +2
4	Code 39 (no check digit)	**17**	EAN13 +5
5	Codabar	**21**	LAC
6	EAN8	**22**	POSTNET
7	EAN13	**23**	Code 93
8	Code 128	**31**	Code 16K
9	MSI	**32**	PDF417
10	UPCA +2	**33**	Maxicode
11	UPCA +5	**40**	Code 39 (MOD 43 check digit)
12	UPCE +2	**41**	UPCA & Price CD
13	UPCE +5	**44**	EAN13 & Price CD
		50	Interleaved 2 of 5 with Barrier Bar

B8. density Bar code density. Use the following table for the bar code density.

Barcode Type	Density Selector	Density (% or cpi)	Narrow Element (dots/mils)	Narrow to Wide Ratio	Data Length	Appearance Codes Available	Char Set
UPCA +2/+5 Price CD	**2** 4	80% 120%	2/10.4 3/15.6	N/A	11 or 12 14/17	1,5,6 **7** or 8	0 to 9
UPCE +2/+5	**2** 4	80% 120%	2/10.4 3/15.6	N/A	6 or 7 9/12	1,5,6 **7** or 8	0 to 9
EAN8 +2/+5	**2** 4	80% 120%	2/10.4 3/15.6	N/A	7 or 8 10/13	1,5,6 **7** or 8	0 to 9
EAN13 +2/+5 Price CD	**2** 4	80% 120%	2/10.4 3/15.6	N/A	12 or 13 15/18	1,5,6 **7** or 8	0 to 9
Interleaved 2 of 5 or I 2 of 5 with Barrier Bar	1 2 3 4 5 6 7 8 9 10 11 **12** 13	1.0 2.0 3.0 4.0 5.3 6.0 7.1 8.3 9.1 10.6 10.6 12.0 13.7	21/109.4 12/62.5 7/36.5 6/31.3 4/20.8 4/20.8 3/15.6 3/15.6 3/15.6 2/10.4 2/10.4 2/10.4 2/10.4	1:3.0 1:2.5 1:3.0 1:2.5 1:3.0 1:2.5 1:3.0 1:2.3 1:2.0 1:3.0 1:3.0 1:2.5 1:2.0	0 to 2710	**8**	0 to 9
Code 39 or MOD 43	1 2 3 4 6 **7** 11 12 20	1.3 1.7 3.3 4.0 6.0 6.6 3.7 12.0 2.8	10/52.1 8/41.7 4/20.8 3/15.6 2/10.4 2/10.4 4/20.8 1/5.2 5/26.0	1:2.5 1:2.5 1:2.5 1:3.0 1:3.0 1:2.5 1:2.0 1:3.0 1:2.2	0 to 2710	**8**	SPACE $%*+-./ 0 to 9 A to Z
Codabar (NW7)	2 3 4 5 7 **8** 9	2.0 2.9 4.3 4.7 7.7 8.4 9.6	8/41.7 6/31.3 4/20.8 4/20.8 2/10.4 2/10.4 2/10.4	1:3.0 1:2.5 1:2.5 1:2.0 1:3.0 1:2.5 1:2.0	0 to 26	**8**	$%*+-./ 0 to 9 : a to d
Code 93	3 4 5 **7** 10	3.6 4.3 5.3 7.1 10.7	6/31.2 5/26.0 4/20.8 3/15.6 2/10.4	N/A	0 to **2710**	**8**	00H to FFH

Barcode Type	Density Selector	Density (% or cpi)	Narrow Element (dots/mils)	Narrow toWide Ratio	Data Length	Appearance Codes Available	Char Set
Code 128	20	3.5/7.0	5/26.0	N/A	0 to 2710	**8**	00H to 7FH
or	4	4.4/8.7	4/20.8				
CODE 16K	6	5.8/11.7	3/15.6				
	8	8.7/17.5	2/10.4				
MSI	4	4.0	4/20.8	1:2.0	0 to 14	**8**	0 to 9
	5	5.3	3/15.6	1:2.0			
	7	6.9	2/10.4	1:2.5			

Barcode Type	Density Selector	Narrow Element (dots/mils)	Short Element (dots/mils)	Element Width (dots/mils)	Data Length	Appearance Codes Available	Char Set
POSTNET	**0** (fixed at 4.3 cpi)	24/125.0	10/52.1	4/20.8 (5 dot gap)	0,5,6,9 or 11	**8**	0 to 9

Barcode Type	Density Selector	Element Width (dots/mils)	Row Height (dots/mils)	Aspect Ratio	Data Length	Appearance Codes Available	Char Set
PDF417	1	2/10.4	2/10.4	1:1	0 to 2710	**8**	00H to FFH
	2	2/10.4	4/20.8	1:2			
(Security	3	2/10.4	6/31.3	1:3			
Levels 1 to	4	3/15.6	3/15.6	1:1			
8)	5	3/15.6	6/31.3	1:2			
	6	3/15.6	9/46.9	1:3			
	7	4/20.8	4/20.8	1:1			
	8	4/20.8	8/41.7	1:2			
	9	4/20.8	12/62.5	1:3			
Maxicode	7	N/A	N/A	N/A	15-99	8	00H to FFH

NOTE: Values in bold indicate the default.

B9. height Bar code height, in 1/100 inches, 1/10 mm, or dots. Minimum values:

English **1**
Metric **2**
Dots **1**

B10. text Appearance of text with bar code. For UPC and EAN only use **1-7**. For all others, use **8**. Options:

1 No check digit or number system
5 Number system at bottom, no check digit
6 Check digit at bottom, no number system
7 Check digit and number system at bottom
8 No text, bar code only

B11. alignment Choose **L**, **R**, **C**, **B** or **E** to align the bar code data correctly in the field. For I2 of 5, Code 39 (Mod 43), Codabar, and MSI, you can use **L**, **R**, **C**, **B** or **E**. For all other bar codes, use **L**.

B12. field rot Field rotation. Field rotation rotates the whole field, not just the characters. Rotation is affected by the pivot point, which varies depending on how text is justified. Lower left corner of field is the pivot point. Options:

0 Top of field points to top of supply
1 Top of field points to left of supply
2 Top of field points to bottom of supply
3 Top of field points to right of supply

NOTE: Serial bar codes printed at speeds greater than 2.5 IPS may not scan properly.

Example:

```
B,3,12,V,150,40,1,2,80,7,L,0 ¦
```

Defines a bar code field (field #3) with 12 characters of variable length starting at row 150, column 40. A UPCA bar code with a density of 2 and a height of 80 is used. The check digit and number system are shown at the bottom. The bar code is left aligned without any field rotation.

Defining Constant Text Fields

A constant text field is a set of fixed characters that prints on all labels. Define each constant text field separately. This field is not assigned a field number, but is counted as a field (keep this in mind, as the printer allows a maximum of **100** fields per format). The characters in this field cannot be changed by batch data. Field options do not apply to constant text fields.

Determine the height and the maximum width of the characters, using the tables in Appendix B, "Fonts." If you're using proportionally spaced fonts, use the average size of the characters. Mark the pivot point of your field. This will vary, depending on how your field is justified.

Syntax

```
C,row,column,gap,font,hgt mag,
wid mag,color,alignment,char rot,
field rot,"fixed char",sym set ¦
```

C1. C Constant Text Field.

C2. row For monospaced fonts, distance from bottom of print area to the pivot point. For proportionally spaced fonts, distance from bottom of print area to baseline of characters in the field. (Bottom exits the printer first.)

English	**0 - 365**
Metric	**0 - 927**
Dots	**0 - 701**

C3. column Distance from the lower left edge of the print area to the pivot point.

English	**0 - 183**
Metric	**0 - 465**
Dots	**0 - 352**

C4. gap Number of dots between characters. Range: **0-99**.

Any number other than **0** or the default number affects your field width. Default spacing:

Letter Gothic Bold 6pt.	**1 dot**
Letter Gothic Bold 9pt.	**2 dots**
All other fonts	**varies with each letter**

C5. font Style of font. Options:

CG Trium Bold		CG Trium Bold Cond	
1000	6.5 pt	**1006**	6.5 pt
1001	8 pt	**1007**	8 pt
1002	10 pt	**1008**	10 pt
1003	12 pt	**1009**	12 pt
1004	18 pt	**1010**	18 pt
1005	22 pt	**1011**	22 pt

Letter Gothic Bold		Reduced	
1012	6 pt	**2**	Internal Font
1013	9 pt		

NOTE: Point sizes greater than 12 include only the following special characters:
0123456789#$%&(),./@DFKLMPS\kpröç£¥.
All other point sizes use the whole symbol set. This information may not apply to optional fonts.

C6. hgt mag Height magnifier, **1-7** (times). Use a magnifier of **1** with proportionally spaced fonts, because characters lose smoothness at higher magnifications for all fonts.

C7. wid mag Width magnifier, **1-7** (times) Proportionally spaced fonts do not have a set width. To estimate the size of your field, use the letter "W" for the widest field or an "L" for an average width field.

C8. color Options for standard printer fonts:

B Opaque, Normal, Black, Normal
D Opaque, Normal, White, Normal
O Transparent, Normal, Black, Normal
R Transparent, Normal, White, Normal
W Opaque, Normal, White, Normal

NOTE: Solid black print should not exceed 30% on a given square inch of the label, or the printhead life may be decreased.

There are two types of field color overlay attributes:

Transparent	The overlay field (text or constant text) does not block out (or "erase") existing fields.
Opaque	The overlay field blocks out (or "erases") existing fields.

Field placement in the packet is an important consideration when using field color attributes. If a line field is defined before the overlay (text or constant text) field, the line field is blocked out by the overlay field, depending on the overlay field's color attribute. If a line field is defined after the overlay field, the line field is not blocked out by the overlay field, regardless of the overlay field's color attribute.

C9. alignment Alignment of constant text in the field. Options:

L Align on left side of field.
C Center text within field (for monospaced fonts only)
R Align on right side of field (for monospaced fonts only)
B Align at midpoint of field
E Align at end of field.

Use **L**, **B**, or **E** for any font.

C10. char rot Character rotation. Options:

0 Top of character points to top of field
1 Top of character points to left of field
2 Top of character points to bottom of field
3 Top of character points to right of field

C11. field rot Field rotation. Lower left corner of field is the pivot point. Options:

0 Top of overlay points to top of supply
1 Top of overlay points to left of supply
2 Top of overlay points to bottom of supply
3 Top of overlay points to right of supply

NOTE: Rotation is affected by the pivot point, which varies depending on how text is justified.

C12. "fixed char" Fixed characters to appear in the field. Maximum **2710** characters. Enclose in quotation marks.

C13. sym set Symbol set. Use **1** (ASCII Symbol Set). (0, 437).

See Appendix C, "Symbol Sets/ Code Pages" for more information.

Example: **`C,30,10,0,1,1,1,B,L,0,0,"MADE IN USA",0`** ¦

Defines a constant text field starting at row 30, column 10. It does not have any additional inter-character gap. The Standard font is used without any additional magnification. The printing is black on white and left justified. No field or character rotation is used. "MADE IN USA" is printed in this field. The internal symbol set is used.

Defining Line Fields

Use lines to form borders and mark out original prices. Define each line separately. This field is not assigned a field number, but is counted as a field (keep this in mind, as the printer allows a maximum of **50** fields per format). You can define any line length and a thickness up to 99 dots, as long as the solid black print does not exceed 30 percent of any given square inch of the label.

Line Types

You can create horizontal and vertical lines. There are two ways to define lines.

Segments You choose the starting point and ending point.

Vectors You choose the starting point, the angle, and the length of the line.

Syntax

```
L,type,row,column,angle/end row,length/
end col,thickness,"pattern" ¦
```

L1. L Line Field.

L2. type Type of line. Only vertical and horizontal lines are supported. Options:

S Segment. You choose the starting point and ending point.

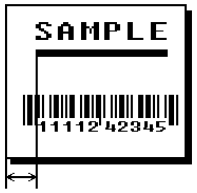
V Vector. You choose the starting point, angle, and length.

L3. row Distance from bottom of print area to the starting point.

English **0 - 365**
Metric **0 - 927**
Dots **0 -701**

L4. column Distance from left edge of the print area to the origin.

English **0 - 183**
Metric **0 - 465**
Dots **0 - 352**



L5. angle/end row If Using *Segments*:
Row location of ending point. Measure from bottom of print area. Ranges same as *row* above. On horizontal lines, this value must match item **L3**.

If Using *Vectors*:
Angle of line. Options: **0**, **90**, **180**, or **270**.

L6. length/end col If Using *Segments*:
Column location of end point. Measure from left edge of print area. Ranges same as *column* above. On vertical lines, this value must match parameter **L4**.

If Using Vectors:
Length of the line in selected units.

Ranges for horizontal lines:
English **0 - 200**
Metric **0 - 508**
Dots **0 - 384**

Ranges for vertical lines:
English **0 - 400**
Metric **0 - 1016**
Dots **0 - 768**

L7. thickness Using the chart below for reference, write the line thickness (**1** to **99**) in box **L7**. Measured in dots.

Dots	Thickness
1	
10	
24	
48	
96	

NOTE: Line thickness fills upward on horizontal lines, or to the right on vertical lines.

L8. "pattern" Line pattern. Enter "".

Example: **L,S,110,30,110,150,10,""** ¦

Defines a horizontal line field as a segment starting at row 110, column 30 and ending at row 110, column 150. The line thickness is 10 dots.

Defining Box Fields

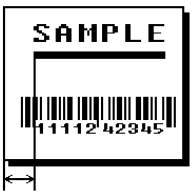
Use boxes to form borders or highlight items of interest. Define each box field separately. This field is not assigned a field number, but is counted as a field (keep this in mind, as the printer allows a maximum of **50** fields per format). You can define any line length and a thickness up to 99 dots, as long as the solid black print does not exceed 30 percent of any given square inch of the label.

Syntax **Q,row,column,end row,end col,thickness, "pattern"** ¦

Q1. Q Box (**Q**uadrilateral) Field.

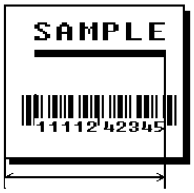
Q2. row Distance from bottom of print area to lower left corner of box.
English **0 - 365**
Metric: **0 - 927**
Dots: **0 - 701**

Q3. column Distance from left edge of print area to lower left corner of box.
English **0 - 183**
Metric: **0 - 465**
Dots: **0 - 352**



Q4. end row Distance from bottom of print area to upper right corner of box. Ranges same as *row*.

Q5. end col Distance from left edge of print area to upper right corner of box. Ranges same as *column*.



Q6. thickness Using the chart below for reference, write the desired line thickness (**1 to 99**) in box **Q6**. Measure in dots.

Dots	Thickness
1	
10	
24	
48	
96	

NOTE: Line thickness fills upward on horizontal lines, or to the right on vertical lines.

Q7. "pattern" Line pattern. Enter "".

Example:

```
Q,240,30,270,150,3,""
```

Defines a box field starting at row 240, column 30. It ends at row 270, column 150. It has a thickness of 3 dots.

DEFINING FIELD OPTIONS 4

This chapter provides a reference for defining

- field options in formats
- check digit packets.

Applying Field Options

Field options further define text and bar code fields. The text, constant text, or bar code field must be previously defined *before* you can apply any field option to it. Define options immediately after the field to which they apply.

Combining Field Options

You can use more than one option with most fields. When you use multiple options for the same field, you must place the options in the order you want to apply them to your format.

Restrictions

Some options cannot be used together. See the following sections addressing individual options for specific combinations to avoid.

Example: **`R,1,3,1,3,1,1 ¦`**

Syntax **`R,option#,parameter...parameter ¦`**

R1. R Indicates field option header.

R2. option# Option number:
- **1** Define fixed characters
- **4** Copy data
- **31** Calculate check digit
- **50** Define bar code densities
- **51** Define security and truncation of PDF417 bar codes
- **52** Define width or length of PDF417 bar codes

R3. parameter(s) Varies per option. See the following option descriptions.

Option 1 (Fixed Data)

Fixed data is information (a company name or store number) you want to print on all labels. You can define fixed characters for an entire field or for part of a field.

Syntax **R,1,"fixed char"** ¦

R1. R Option Header.

R2. 1 Option **1**.

R3. fixed char Characters to insert. Enclose in quotation marks. If you are defining fixed characters for part of a field, place underscores (_) in non-fixed positions. Any spaces in the phrase are fixed characters. Range: **0** - **2710**.

Underscore characters are stripped out and the data is compressed if no data is supplied by the batch and the field length is variable.

Example: **R,1,"_ _ _%$_ _ _ _ _"** ¦

Uses fixed characters (%$) in positions four and five. The other positions are variable.

Example: **R,1,"MONARCH"** ¦

"MONARCH" appears as a fixed field in this example.

Option 4 (Copy Data)

You can create a field that uses data from another field. This is useful for creating merged fields or sub-fields. You can copy the information from multiple fields into one field by applying the copy procedure more than once. Copy data is the only option you can apply to a field more than once.

The maximum number of characters defined in box **T3** or **B3** must allow for the number of characters you will place in the field, including any price, check digit, or fixed characters inserted by the printer. The maximum number of characters in the field into which data is copied cannot exceed **2710** or the maximum number of characters permitted by the **bar code**.

When copying from more than one field, copy into the destination field from left to right.

Syntax

```
R,4,src fld,src start,# to copy,dest
start,copy code ¦
```

R1. R Field Option Header.

R2. 4 Option **4**.

R3. src fld Field number from which data is copied. Range: **0** to **999**

R4. src start Position number in the source field of the first character to be copied. Character positions are numbered **1** to **2710**, starting from the left.

R5. # to copy Number of characters to copy. Range: **1** to **2710**.

R6. dest start Position number where copied characters are to begin printing in the destination field. Range: **1** to **2710.**

R7. copy code Copy Method.

1 Copy field as is (including price symbols, pad characters, check digits, etc.).

2 Copy unformatted data (without price characters, pad characters, etc.).

Example **R,4,3,1,3,1,1 ¦**

Copies data from field #3, starting at the first position and copying three characters. In the destination field, the information is placed in position 1 and copied as formatted data.

Merging Fields

You can copy data to merge the contents of fields. Use the copy data option as many times as necessary to copy all the appropriate fields into the merged field.

In the following example, two text and two non-printable fields are shown. Data from these fields is merged to form field 5, and is then printed as a bar code.

Field	Data	Field Type
1	203	Non-printable
2	339	Non-printable
3	8	Text
4	BLUE	Text
5	2033398BLUE	Bar Code

To create this sequence:

1. Define fields 1, 2, 3, and 4.
2. Define field 5 as a bar code. Allow enough characters in the bar code field to hold all the copied characters.
3. Apply Option 4 to field 5 once for every source field.

Sub-Fields

You can copy a segment of data from one field into a new location, called a sub-field. For example, extract part of the data in a bar code and display it in text form in a sub-field. Then, use the copy data option.

Option 31 (Calculate Check Digit)

The printer generates a check digit if you apply Option 31 to the field. You cannot use this option if the field contains a UPC, EAN, or Code 39 (with the MOD43 check digit) bar code.

Syntax **`R,31,gen/ver,check digit #`** p

R1. R Option Header.

R2. 31 Option **31**.

R3. gen/ver Enter **G** to generate a check digit.

R4. check digit # Specifies a check digit scheme. Enter a number that identifies a check digit scheme that has been defined. For more information, see "Using Check Digits." Range: **1** - **10**.

Example **`R,31,G,5`** p

Generates a check digit using the previously defined check digit scheme 5.

Option 50 (Bar Code Density)

You can apply this option to bar code fields when you want to create custom densities. When you apply this option, it overrides the density value in the bar code field.

When using this option, set the density parameter in your bar code field to the default value. You can only use this option once for each bar code field. This option overrides the density selected in the bar code field.

Bar codes produced using Option 50 may not be scannable. The additional character gap, narrow space, and wide space parameters are valid **only** with Code 39 and Codabar. If these parameters are specified for any other bar codes, they will be ignored by the printer. Do not use Option 50 with UPC or EAN bar codes.

Syntax **R,50,narrow,wide,gap,nar_space,wide_space**
¦

R1. R Field Option Header.

R2. 50 Option **50**.

R3. narrow Dot width of the narrow element. Range: **1-99**.

R4. wide Dot width of the wide element. Range: **1-99**.

R5. gap Additional dot space between characters. Enter a value of **1** to **99**. (Code 39 and Codabar only.)

R6. nar_space Additional dot width of the narrow bar code space. (Code 39 and Codabar only). Range: **1- 99**.

R7. wide_space Additional dot width of the wide bar code space. (Code 39 and Codabar only). Range: **1- 99**.

Example: **R,50,4,8,5,1,1** ¦

Creates a custom bar code density with a narrow element of 4 dots, a wide element of 8 dots, a gap of 5 dots, and one additional dot width for the narrow and wide bar code space (if this is a Code 39 or Codabar bar code).

Option 51 (PDF417 Security/Truncation)

You can define a security level and choose whether or not to truncate a PDF417 bar code. Higher security levels add data to a bar code, improving scan reliability. Some damaged bar codes may still be scannable if the security level is high enough. You can use this option to create standard PDF417 bar codes or use the truncated option to create a narrower bar code. This option can appear only once per PDF417 field, in any order, following the bar code field.

As the security level is increased, so is the size of your PDF417 bar code. For each level increased, the bar code will double in size.

Syntax **`R,51,security,stand/default ¦`**

R1. R Option Header.

R2. 51 Indicates Option **51**.

R3. security Security level ranges from **0-8** (**0** is the default).

Higher security levels add data to a bar code, improving scan reliability. Some damaged bar codes may still be scannable if the security level is high enough.

R4. stand/def Truncation selector. Valid values:
S (default) a standard PDF417 bar code
T truncated

Example **`R,51,2,S ¦`**

Defines a security level of 2 for a standard PDF417 bar code.

Option 52 (PDF417 Width/Length)

This option defines the image width or length of a PDF417 bar code. If you define a fixed number of columns (width), the bar code expands in length. If you define a fixed number of rows (length), the bar code expands in width.

Column value does not include start/stop or left/right indicator columns.

If this option does not immediately follow the PDF417 bar code field, the default settings are used. You can only use this option once per PDF417 bar code field.

Syntax **`R,52,row/column,dimension ¦`**

R1. R Option Header.

R2. 52 Indicates Option **52**.

R3. row/column Indicates if you are defining the number of rows or columns.
R Row
C Column

If you specify rows, the bar code expands in columns, or vice versa.

R4. dimension The number of rows or columns defined for the bar code. The default is **4**. Valid values:
3-90 for rows
1-30 for columns

Example: `R,52,C,10 ¦`

Defines the column width of 10, which expands the PDF417 bar code length by 10.

Option 61 (Re-image Field)

If you have a constant field that appears on top of a non-constant field, apply this option to the constant field. For example, you may create a tag for an item on sale. The tag shows both the old and the new prices, but has a line drawn through the old price.

The constant field can be a line, a box, a graphic, or constant text. This option redraws the constant field when the other field changes. If you do not use this option, the field may appear broken.

Syntax `R,61 ¦`

Using Check Digits

Check digits are typically used to ensure that a text or bar code field scans correctly. If you apply Option 31, the printer calculates a check digit. A check digit scheme determines how the printer calculates a check digit. When you define a check digit scheme, you assign a number to identify it. This number is later entered in box **R4** when you apply Option 31 to a field. You can use check digits with text or bar code fields. Check digit calculations are performed on *numeric* data only.

Do not use check digits with price fields. Do not define a check digit scheme for these bar codes, because they have predefined check digits: UPC, EAN, Code 39 (with the MOD43 check digit), and Code 93.

Syntax **{A,selector,action,device,modulus, fld_length,D/P,"weights"** ¦ **}**

A1. A Check Digit Header.

A2. selector Assign a number from **1-10** to this check digit formula.

A3. action Adds a check digit scheme. Enter **A**.

A4. device Device. Use **R**.

A5. modulus Number from **2-11**. The modulus is used to divide the sum of products or the sum of digits.

A6. fld_length The maximum number of characters the field will contain. Range: **0 - 2710**.

A7. D/P Algorithm. The algorithm determines how the check digit is calculated. Options:
D sum of digits
P sum of products

A8. "weights" String of digits used for calculation. A weight string is a group of two or more numbers that is applied to a field. The number of digits in this string should equal the number in *fld_length*. Enclose in quotation marks. Range: **0 - 2710**.

Example: **{A,1,A,R,10,5,P,"65432"** ¦ **}**

Adds check digit scheme number 1 to the printer's memory. The modulus is 10, the maximum number of characters in the field is 5. The check digit is calculated by using the Sum of Products and the string of digits used in the calculation is "65432."

Sum of Products Calculation

This is an example of how the printer uses Sum of Products to calculate a check digit for this data:

5 2 3 2 4 5 2 1 9

1. Weights are applied to each digit, starting with the last digit in the weight string. They are applied right to left, beginning at the right-most position of the field. Remember, a weight string must contain at least two different numbers. This example has a weight string of **1,2,3,4**:

field:	**5**	**2**	**3**	**2**	**4**	**5**	**2**	**1**	**9**
weight string:	4	1	2	3	4	1	2	3	4

2. Each digit in the field is multiplied by the weight assigned to it:

field:	**5**	**2**	**3**	**2**	**4**	**5**	**2**	**1**	**9**
weight string:	4	1	2	3	4	1	2	3	4
products:	**20**	**2**	**6**	**6**	**16**	**5**	**4**	**3**	**36**

3. Next, the product of each digit is added together. This is the sum of the products.

   20 + 2 + 6 + 6 + 16 + 5 + 4 + 3 + 36 = 98

4. Divide the sum of the products by the modulus (**10** in this case), only to the whole number. The balance is called the remainder.

```
     9
10 ⌈98
   90
    8
```

5. Subtract the remainder from the modulus.

   The result becomes the check digit. In this case, the check digit is **2**.

   10 - 8 = 2

Sum of Digits Calculation

This is an example of how the printer uses Sum of Digits to calculate a check digit for this data:

5 2 3 2 4 5 2 1 9

1. Weights are applied to each digit, starting with the last digit in the weight string. They are applied right to left, beginning at the right-most position of the field. Remember, a weight string must contain at least two different numbers. This example has a weight string of **1,2,3,4**:

field:	**5**	**2**	**3**	**2**	**4**	**5**	**2**	**1**	**9**
weight string:	4	1	2	3	4	1	2	3	4

2. Each digit in the field is multiplied by the weight assigned to it:

field:	**5**	**2**	**3**	**2**	**4**	**5**	**2**	**1**	**9**
weight string:	4	1	2	3	4	1	2	3	4
products:	**20**	**2**	**6**	**6**	**16**	**5**	**4**	**3**	**36**

3. Next, the digits of the products are added together. Two-digit products are treated as two separate digits. This is the sum of the digits.

2 + 0 + 2 + 6 + 6 + 1 + 6 + 5 + 4 + 3 + 3 + 6 = 44

4. Divide the sum of the digits by the modulus (**10** in this case), only to the whole number. The balance is called the remainder.

```
     4
10 ⌐44
   40
    4
```

5. Subtract the remainder from the modulus.

   The result becomes the check digit. In this case, the check digit is **6**.

   ```
   10 - 4 = 6
   ```

PRINTING

5

This chapter describes how to

- define the batch header, batch control, and batch data files
- create a Print Control Packet.

Defining the Batch Header

Batch data is the actual information printed on the supply. Batch data fills in the format's text, bar code, and non-printable text fields.

A batch packet contains three parts:

batch header	identifies the format and how many labels to print.
batch control	defines the print job.
batch data (optional)	defines the actual information printed on the label.

A batch header begins the file. It tells which format the batch uses and how many labels to print. To record batch data, make a copy of the worksheet in Appendix D, "Format Design Tools."

Syntax **{B,format#,N/U,quantity** ¦

B1. B Batch Header.

B2. format# Format number (**0-999**) to use.

B3. N/U Controls how image is generated.

N New. Erase image and re-image all fields using online data. Any missing fields will be blank.

U Update last image with 1 or more fields. All other fields remain the same as the last queued batch.

B4. quantity Quantity to print (**0-24**).

Using **0** pre-images the field to reduce the imaging time for labels. See "Batch Quantity Zero Method" for more information.

Example: **{B,1,N,1** ¦

Defines a batch header that uses format #1 and reimages all fields using the online data. One label is printed with this batch.

Defining the Batch Control Field

The batch header must precede this field. The batch control field defines the print job and applies only to the batch that immediately follows.

Syntax **E,feed_mode,batch_sep,print_mult, multi_part** ¦

E1. E Batch Control Field.

E2. feed_mode Feed Mode. Options:
0 Continuous Feed (default)
1 On-Demand

E3. batch_sep Batch Separator. Use **0**.

E4. print_mult Number of tags with the same image. Use **1**.

E5. multi_part Number of identical parts on one tag. Use **1**.

Example: **E,0,0,1,1** ¦

Defines a batch control field. Continuous feed mode is used and no separator prints between batches.

Defining Batch Data Fields

Batch data fields should be sent in field number order. Use continuation fields for large amounts of data. If you are using **N** (New) in the batch header, you must list all fields with your data in sequence. If you are using **U**, you need to list only those fields and data that changes from the last printed batch.

Syntax

```
field#,"data string" ¦
C,"continuation" ¦
```

field# Identifies the text, bar code, or non-printable text field in which to insert the following data. Range: **0** - **999**.

"*data string*" Provides the actual information to appear in fields. Enclose in quotation marks. Range: **0 - 2710**.

C Identifies information to be appended to the data string. (This parameter is optional.)

"*continuation*" Provides the actual information to be added to the batch packet. Enclose in quotation marks. Use this option to break up longer fields. (This parameter is optional.)

Example:

```
1,"Size 12" ¦
2,"" ¦
3,"Blue" ¦
C,"and this would be appended." ¦
```

Defines a batch data field. "Size 12" prints in field #1, a blank line appears in field #2, "Blue and this would be appended" prints in field #3.

Merged or Sub-Fields

If a field is completely filled by data copied from other fields, use quotation marks without spaces between them for the "*data string*" parameter.

Downloading Methods

You can use pclOpen or pclWrite to write the packet to the printer, or you can download the format and batch data using one of three methods: sequential method, batch method, batch quantity zero method. Refer to the *Programmer Manual* for more information.

Sequential Method

Using the sequential method, you send all your format and batch data at one time. Use this method when your application does not require operator intervention to input data. All data is sent down at one time, and the printer then images each field. As soon as the last field is imaged, your labels begin to print.

Example:

```
{Format}
{Batch Packet}
```

Batch Method

This is similar to the sequential method, but it is used when you want to send multiple batches. All data for the first batch is sent at one time, and the printer then images each field. As soon as the last field for the first batch is imaged, labels begin to print. This process is repeated for each subsequent batch.

Example:

```
{Format}
{Batch Packet}
{Batch Packet}
```

Batch Quantity Zero Method

You may use the batch quantity zero method when your application requires operator intervention to enter data. While the operator is entering data, the previous field is sent with a batch quantity of zero. The printer images the field, but does not print it. After the operator enters the data for the last field, the batch quantity can be specified. The last remaining field is imaged, and the label prints almost immediately.

To use the batch quantity zero method:

1. Send the format and a batch header in one file. The first time you send the batch header, use the parameter **N** (new batch), and the parameter **0** for (zero quantity). This ensures the label is properly positioned.

   The printer images constant text, line, and box fields, but does not print them.

2. Input data for each field, and send it with a batch header using the parameter **U** (batch update) and a quantity of zero. When the printer receives the data, it immediately images the field, but does not print it.

   At this time, the printer is imaging all associated fields, including fields that copy from other fields.

3. Repeat step 2 for each field except the last one.

4. For the last field, input data and send a batch header with the quantity of labels you want printed. When the printer receives input for the last field, it immediately prints the labels. See "Reducing Imaging Time" in Chapter 8 for an example using the batch quantity zero method.

Defining the Print Control Packet

Use the print control packet (C) to set the contrast, print, and margin adjustment, print speed, and printhead width.

Syntax **{I,C,contrast,print_adj,margin_adjust, speed_adj,ph_width ¦ }**

C1. C Print Control Packet

C2. contrast **-390** to **156**. 0 is the default for all printers.

C3. print_adj **-99** to **99** in 1/192 inch. 0 is the default for all printers. Adjusts where data prints vertically on the supply. Increase the print position to move print up, decrease to move print down.

C4. margin_adj **-99** to **99** in 1/192 inch. 0 is the default for all printers. Adjusts where data prints horizontally on the supply. Increase the margin position to move print to the right, decrease to move print to the left. Margin and print position are format adjustments. They will not affect the supply position, dispense position, or backfeed distance.

C5. speed_adj Print speed in inches per second (IPS). Options:

0 Default value

C6. ph_width Width of the printhead in dots. Use **0** for these printers.

Example **{I,C,0,-20,-10,0,0 ¦ }**

Uses the default contrast, moves print 0.1 inch closer to the bottom of the supply (20/192 inches) and .05 inch to the left on the supply (10/192 inches), prints at 1.8 inches per second, and uses the default printhead width.

Clearing Packets from Memory

You may want to remove packets from the printer to increase memory storage capacity or if the formats/fonts are no longer needed. In some cases, turning the printer off may clear the packets from memory. If not, send a format clear packet.

Syntax **{header,packet#,action,device ¦ }**

1. header Identifies the packet. Options:
- **A** Check Digit Scheme
- **F** Format
- **G** Graphic
- **W** Font

2. packet# Identification number of the packet to clear (**1-999**) or font number (**0-9999**). 0 is for all fonts.

3. action Enter **C** to clear the packet.

4. device Storage device. Options:
- N Nonvolatile RAM
- **R** Volatile RAM

Example **{F,1,C,R** p **}**

Clears Format #1 from volatile RAM.

CREATING GRAPHICS

6

This chapter provides information on how to

- map out the graphic image using the hexadecimal (hex) or run length method.
- create a graphic packet using a graphic header, bitmap, duplicate, next-bitmap, text, constant text, line, and box Fields.
- place a graphic image into a format.

You can use graphic packets to create compliance labels or bitmapped images. To include a graphic packet within your format, your format must contain a graphic field. See "Placing the Graphic in a Format" for more information.

Overview of Bitmapped Images

A printed image is formed through a series of dots. Each square on the grid below represents a dot on the printhead. The graphic image is created by blackening dots in a specific pattern. You can print varying shades of gray according to the concentration of dots on the image. When the dots are printed together, the end result is a graphic image.

Determining a Method

You can use one of two methods to map out your graphic image:

Hex Method — The dot sequences are segmented into binary numbers and then converted to hex numbers.

A graphic using gray-scaling, several slanted lines, or several vertical lines typically translates more efficiently with hex representation.

Run Length Encoding Method — The dot sequences are segmented into black and white strings within a row. The total count of each white string is converted to a lower-case letter, corresponding to numeric value. The total count of each black string is converted to an uppercase letter, corresponding to numeric value. This method can reduce imaging time for graphics that contain repetitive rows of dots. A graphic with horizontal lines or very few white-to-black borders typically translates more efficiently with run length encoding.

The most efficient encoding method depends on how complicated your graphic image is and whether or not imaging time is a concern. You may want to experiment with both encoding methods to get optimal performance.

Designing Bitmapped Images

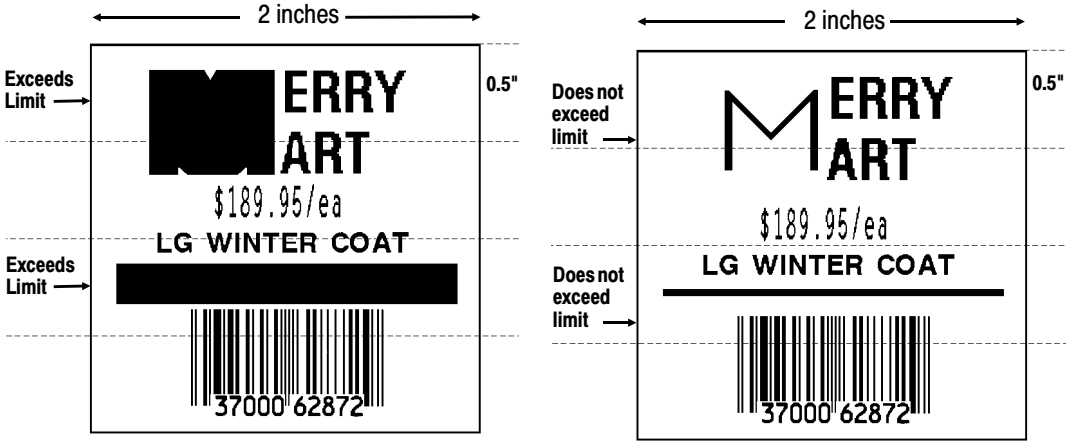
Once you determine the encoding method to use, you can begin mapping out your graphic image.

The image that you map must be an upside down mirror image of the final result.

Special Considerations

Solid black print cannot exceed 30% of any given square inch of the supply. If the black print exceeds this limit, you may lose data or damage the printhead.

In the first label, the large "M" logo and thick black line exceed the allowed black to white print ratio. In the second label, the large "M" logo does not exceed the black to white print ratio.

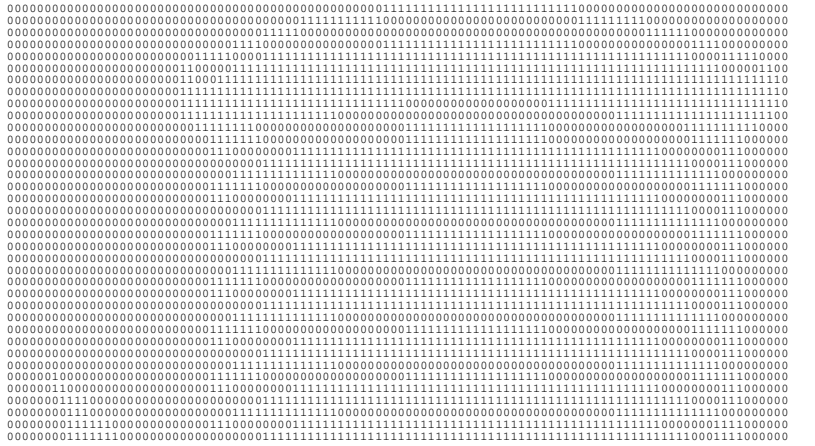


Using the Hex Method

The following steps explain how to derive a hex character string from a bitmapped graphic.

Each square on the grid represents a dot. A black square indicates the dot is ON, and a white square indicates the dot is OFF. A sequence of binary numbers, called a bit pattern or bitmap, determines what dots are on and off. The numbers "0" and "1" are used for this purpose. The number "1" turns a dot on and "0" turns a dot off.

1. Assign 1 to every black square and 0 to every white square.



2. Section off the grid in columns of eight. If any rows are not divisible by 8, add enough 0's to complete a column.

```
00000000 00000000 00000000 00000000 00000000 00000000 00111111 11111111 11111111 11110000 00000000 00000000 00000000
00000000 00000000 00000000 00000000 00000001 11111111 11000000 00000000 00000000 00001111 11111000 00000000 00000000
00000000 00000000 00000000 00000000 00111110 00000000 00000000 00000000 00000000 00000000 00000111 11100000 00000000
00000000 00000000 00000000 00000011 11000000 00000000 00111111 11111111 11111111 11110000 00000000 00011110 00000000
00000000 00000000 00000000 01111100 00111111 11111111 11111111 11111111 11111111 11111111 11111111 11100001 11110000
00000000 00000000 00000001 10000011 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111110 00001100
00000000 00000000 00000001 10001111 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111110
00000000 00000000 00000001 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111111 11111110
00000000 00000000 00000001 11111111 11111111 11111111 11111000 00000000 00000000 11111111 11111111 11111111 11111110
00000000 00000000 00000001 11111111 11111111 11110000 00000000 00000000 00000000 00000000 01111111 11111111 11111100
00000000 00000000 00000000 01111111 10000000 00000000 00000111 11111111 11111111 00000000 00000000 00111111 11110000
00000000 00000000 00000000 00011111 11000000 00000000 00000111 11111111 11111111 00000000 00000000 00011111 11000000
00000000 00000000 00000000 00001100 00000011 11111111 11111111 11111111 11111111 11111111 11111110 00000001 11000000
00000000 00000000 00000000 00000000 00111111 11111111 11111111 11111111 11111111 11111111 11111111 11100001 11000000
00000000 00000000 00000000 00000011 11111111 11110000 00000000 00000000 00000000 00000000 01111111 11111110 00000000
00000000 00000000 00000000 00011111 11000000 00000000 00000111 11111111 11111111 00000000 00000000 00011111 11000000
00000000 00000000 00000000 00011111 11000000 00000000 00000111 11111111 11111111 00000000 00000000 00011111 11000000
00000000 00000000 00000000 00001100 00000011 11111111 11111111 11111111 11111111 11111111 11111110 00000001 11000000
00000000 00000000 00000000 00000000 00111111 11111111 11111111 11111111 11111111 11111111 11111111 11100001 11000000
00000000 00000000 00000000 00000011 11111111 11110000 00000000 00000000 00000000 00000000 01111111 11111110 00000000
00000000 00000000 00000000 00011111 11000000 00000000 00000111 11111111 11111111 00000000 00000000 00011111 11000000
00000000 00000000 00000000 00011100 00000011 11111111 11111111 11111111 11111111 11111111 11111110 00000001 11000000
00000000 00000000 00000000 00000000 00111111 11111111 11111111 11111111 11111111 11111111 11111111 11100001 11000000
00000000 00000000 00000000 00000011 11111111 11110000 00000000 00000000 00000000 00000000 01111111 11111110 00000000
00000000 00000000 00000000 00011111 11000000 00000000 00000111 11111111 11111111 00000000 00000000 00011111 11000000
00000000 00000000 00000000 00011100 00000011 11111111 11111111 11111111 11111111 11111111 11111110 00000001 11000000
00000000 00000000 00000000 00000000 00111111 11111111 11111111 11111111 11111111 11111111 11111111 11100001 11000000
00000000 00000000 00000000 00000011 11111111 11110000 00000000 00000000 00000000 00000000 01111111 11111110 00000000
00000000 00000000 00000000 00011111 11000000 00000000 00000111 11111111 11111111 00000000 00000000 00011111 11000000
00000000 00000000 00000000 00011100 00000011 11111111 11111111 11111111 11111111 11111111 11111110 00000001 11000000
00000000 00000000 00000000 00000000 00111111 11111111 11111111 11111111 11111111 11111111 11111111 11100001 11000000
00000000 00000000 00000000 00000011 11111111 11110000 00000000 00000000 00000000 00000000 01111111 11111110 00000000
00000000 00000000 00000000 00011111 11000000 00000000 00000111 11111111 11111111 00000000 00000000 00011111 11000000
00000000 00000000 00000000 00011100 00000011 11111111 11111111 11111111 11111111 11111111 11111110 00000001 11000000
00000000 00000000 00000000 00000000 00111111 11111111 11111111 11111111 11111111 11111111 11111111 11100001 11000000
00000010 00000000 00000000 00011111 11000000 00000000 00000111 11111111 11111111 00000000 00000000 00011111 11000000
00000011 00000000 00000000 00011100 00000011 11111111 11111111 11111111 11111111 11111111 11111110 00000001 11000000
00000001 11100000 00000000 00000000 00111111 11111111 11111111 11111111 11111111 11111111 11111111 11100001 11000000
00000000 11110000 00000000 00000011 11111111 11110000 00000000 00000000 00000000 01111111 11111110 00000000
00000000 11111100 00000000 00011100 00000011 11111111 11111111 11111111 11111111 11111111 11111110 00000001 11000000
00000000 11111110 00000000 00000000 00111111 11111111 11111111 11111111 11111111 11111111 11111111 11100011 11000000
```

3. One row at a time, convert each group of eight binary digits to hex.

   starting at position 49 ...

   00111111 = 3F
   11111111 = FF
   11111111 = FF
   11110000 = F0

4. Write the hex values for each row as a continuous string.

   row 1, position 49 = 03FFFFFF00000

5. Repeat steps 3 through 4 for each row on the grid.

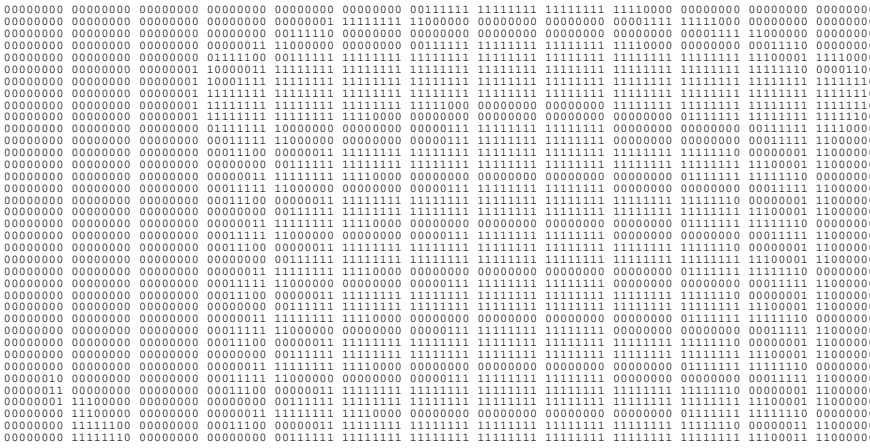
6. Insert the hex values in syntax format.

Using the Run Length Encoding Method

The following steps explain how to derive a run length character string from a bitmapped graphic.

Each square on the grid represents a dot. A black square indicates the dot is ON, and a white square indicates the dot is OFF.

For visual clarity, the following example shows "1" to indicate when a square is ON, and "0" to indicate when a square is OFF. You do not have to convert your dots when using the run length method.



1. Count the number of consecutive OFF or ON dots in a row. Write the number of consecutive dots in sequence for the first row on the grid. Write "ON" or "OFF" after each number to indicate ON or OFF dots.

   (row 1, position 50) 26 on
   (row 2, position 39) 11 on, 26 off, 9 on
   (row 3, position 34) 5 on, 45 off, 6 on.

2. Replace each number you have written with its corresponding code from the Dot to Run Length Encoding Chart provided in Appendix C, "Symbol Sets/Code Pages." Be sure to use CAPITAL letters for black dots and lower-case letters for white dots.

   26 on (Z)
   11 on (K), 26 off (z), 9 on (I)
   .
   .

If the number is greater than 26, write z, followed by the letter corresponding to the amount over 26. For example, to represent 45 off dots, write zs.

```
5 on (E), 45 off (zs), 6 on (F)
.
.
```

3. Write the letter codes in sequence, uninterrupted, for each row.

```
(row 1,position 50) Z
(row 2,position 39) KzI
(row 3,position 34) EzsF
(row 4,position 30) DpZoD
.
.
```

If the end of the line specifies OFF dots (lower-case letters), the ending lower-case letters can be omitted. For example, uZFu can be written as uZF.

---

4. Repeat steps 1 through 5 for each row on the grid.
5. Insert the code values in syntax format.

Determining How to Store the Image

Once you have mapped out your graphic image, determine how you want to store it. You have two options:

- RAM
- Temporary Storage

Using RAM

You should use RAM when the graphic image is used by several formats, because you only have to send the graphic image once. This eliminates the need to send the graphic image repeatedly. See "Placing the Graphic in a Format," for more information about using the graphic packet in a format. Graphics smaller than approximately 1/2 inch by 1/2 inch can be stored in printer RAM and referenced by the graphic ID number.

Graphics are stored in the image buffer and remain there until another format is sent or the printer is turned off.

Using Temporary Storage

You should use temporary storage when the graphic image is used only in one format or your graphic image is very large. Graphic data in temporary storage is held in the image buffer until another format is used for printing. You can use the same graphic image multiple times on a format. Send the graphic image to the printer after the format to which it applies.

If a graphic is stored in temporary storage, do not place a graphic field in the format. This will cause an error. Instead, position the graphic image by using the row and column locations in the graphic packet header.

Graphic images remain in temporary storage until the image buffer is cleared (a new format is sent). Image memory (temporary storage) will accept a graphic packet 701 rows long with 352 dots per row.

Creating a Graphic Packet

Your graphic packet can contain

- bitmapped fields (for bitmapped images)
- constant text fields
- lines
- boxes.

Images using hex representation or run length encoding are bitmapped images. See "Designing Bitmapped Images" to design your bitmapped image.

Once you design your graphic image, you are ready to define a graphic packet. This packet generates the graphic image you use in a format.

Positioning the Graphic Image

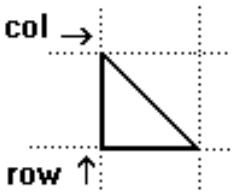
This section explains how to position the graphic image within a graphic packet header, a field of a graphic packet, or within a format.

Within the Graphic Packet Header

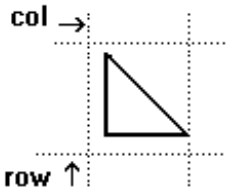
When you are using RAM, the row and column parameters in the graphic header are usually 0,0, because placement is controlled by the graphic field in your format. This is especially true when designing a compliance label overlay.

When you are using temporary storage, these parameters control the placement of the graphic image on the supply.

The area enclosed within the dotted lines represents the graphic image starting at 0,0 (as defined in the graphic header).



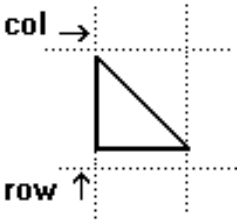
If you want a fixed amount of white space around your graphic image, use something other than 0 for row and/or column.



The area enclosed within the dotted lines represents the graphic image starting at 0,0 with a fixed amount of white space (10,10) around the graphic image.

Within the Field

In a bitmap, constant text, line, or box field, the row and column parameters control where an individual field or bitmapped row begins in relation to the coordinates defined in the graphic header.



The bottom of the triangle in this example represents the first field of the graphic packet starting at 10,0.

Within a Format

When you define the graphic field within your format, the row and column parameters represent where on the format to place the graphic image.

If you are doing a compliance label, these numbers are usually 0,0, because your compliance label covers the entire supply. See "Placing the Graphic in a Format" for a sample compliance label.

If you are placing a graphic (a logo, for example) within a certain area on your supply, enter the starting position (bottom left corner) of the graphic image.

This label shows the triangle "logo" beginning (the bottom left corner) at 155, 33 as defined in the graphic field.

Defining the Graphic Header

Every graphic packet must contain a graphic header. This is the first thing you enter. It identifies and provides important measurement and formatting information for the graphic. Bitmap, duplicate, next-bitmap, constant text, line, and box fields follow the graphic header, if they are used.

Syntax

```
{G,graphID,action,device,units,row,col,
mode,"name" ¦
```

G1. G Graphic Header.

G2. graphID Unique number from 0 to 999 to identify the graphic image.

G3. action Enter A to add the graphic to the printer.

G4. device Graphic storage device:
R Volatile RAM (format must contain a graphic field)
T Temporary storage

G5. units Unit of measure. Options:
E English, measured in 1/100 inches
M Metric, measured in 1/10 mm
G Graphic, measured in dots. For bitmapped graphics, G is the only valid option.

G6. row Distance between the bottom of the graphic image area and the first bitmap line. This is usually 0, unless you want a fixed amount of white space around the graphic image. See "Positioning the Graphic Image," for more information.

English 0 - 365

Metric 0 - 927

Dot 0 - 701

G7. column Distance between the left edge of the graphic image area and the left edge of first bitmap line. This is usually 0, unless you want a fixed amount of white space around the graphic image. See "Positioning the Graphic Image," for more information.

English 0 - 183

Metric 0 - 465

Dot 0 - 352

G8. mode Imaging mode. Enter 0.

G9. "name" Graphic name (optional), 0-8 characters, enclose within quotation marks.

Example **{G,99,A,R,G,0,0,0,"99Wire"** ¦

Adds a graphic image identified by number 99 to volatile RAM. The graphic uses dot measurement. The image will be placed according to the row and column parameters in the graphic field. The imaging mode is 0 and the image is called 99Wire.

Creating Bitmap Fields

This defines one row of dots, starting at a specific row and column within the graphic image. Each unique row of dots requires a bitmap field. A bitmap field can later be repeated by using a duplicate field.

Syntax **B,row,column,algorithm,"data"** ¦

B1. B Bitmap Field.

B2. row Distance (in dots) from the graphic image's bottom margin to the bitmap line.

English	0 - 365
Metric	0 - 927
Dot	0 - 701

B3. column Distance (in dots) from the graphic image's left edge to the bitmap line.

English	0 - 183
Metric	0 - 465
Dot	0 - 352

B4. algorithm Coding method for bitmap data:
H Hex Representation
R Run Length Encoding

B5. data Character string made up of hex or run length encoding. Do not put spaces or any other character between the numbers. Range: 0 - 2710.

Example **{B,39,56,H,"3FFFFF0"** ¦

Defines a bitmapped graphic field. The image begins 39 dots from the bottom and 56 dots from the left edge of the graphic area. Hex representation is used.

Creating Next-Bitmap Fields

This field uses the previous field's row and column locations. It allows you to use the bitmap or duplicate field data without having to recalculate row and column locations. This field represents one row of dots on the image.

Syntax

```
N,adjdir,adjamt,algorithm,"data" ¦
```

N1. N Next-Bitmap Field.

N2. adjdir Increments or decrements the row count. Inserts the duplicate line after or before the current row.

0 Increments (inserts after)
1 Decrements (inserts before)
For example:
B,50,35,R,"GsSsG" ¦
N,0,R,"DpZoD" ¦
prints a next-bitmap field on row 51 at column 35.

N3. adjamt Amount of row adjustment in dot rows. Using 0 overwrites the same line. Range: 0 - 99.

N4. algorithm Coding method for bitmap data:
H Hex Representation
R Run Length Encoding

N5. "data" Character string made up of hex or run length encoding. Do not put spaces or any other character between the hex numbers or run length code letters. Range: 0 - 2710.

Example

```
B,39,56,H,"3FFFFFF0" ¦
N,0,1,H,"000000E00000" ¦
```

Defines a next-bitmap graphic field beginning on row 40. The row count increments by 1. Hex representation is used.

Creating Duplicate Fields

If a line of data is identical to a previous bitmap or next-bitmap field, the duplicate field allows you to repeat the dot sequence without retyping the data. A duplicate field represents one row of dots on the image.

Duplicate fields are useful when you have a graphic with a lot of repetition.

Syntax **D,adjdir,adjamt,count ¦**

D1. D Duplicate Field.

D2. adjdir Increments or decrements the row count. Inserts the duplicate line after or before the current row.

0 Increments (inserts after)
1 Decrements (inserts before)
For example:
B,50,35,R,"GsSsG" ¦
D,0,20,2 ¦
inserts row 50 again at row 70 and row 90. Rows 70 and 90 do not have to be defined later.

D3. adjamt Amount of row adjustment in dot rows. Range: 0 - 99. The above example adjusts the duplicate field to image on row 70 and 90 (adding 20 to the current row count).

D4. count Number of times to duplicate the line. Range: 0 - 99.

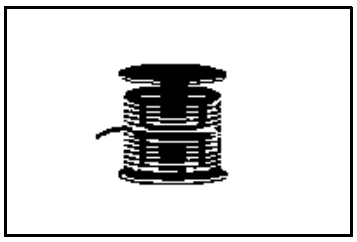
Example

```
B,117,24,H,"03FFFFFFFFFFFFFFFFFFC" ¦
D,0,1,2 ¦
```

Defines a duplicate field that is imaged after the bitmap line. This field duplicates the preceding bitmap line twice (at row 118 and 119).

You can use constant text, line, or box fields in a graphic packet to create a compliance label overlay. See Chapter 3, "Defining Fields," for more information about these fields.

Sample Hex Graphic Packet

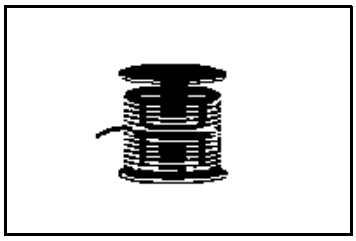


```
{G,99,A,R,G,0,0,0,"99WIRE"
B,39,48,H,"3FFFFFF0" ¦
B,40,32,H,"01FFC000000FF8" ¦
B,41,32,H,"3E00000000000FC0" ¦
B,42,24,H,"03C0003FFFFFF0000F" ¦
B,43,24,H,"7C3FFFFFFFFFFFFE1F0" ¦
B,44,16,H,"0183FFFFFFFFFFFFFFF06" ¦
B,45,16,H,"018FFFFFFFFFFFFFFFFFE" ¦
B,46,16,H,"01FFFFFFFFFFFFFFFFFFE" ¦
B,47,16,H,"01FFFFFF80001FFFFFFFE" ¦
B,48,16,H,"01FFFFF0000000007FFFC" ¦
B,49,24,H,"7F800007FFFF00003FF0" ¦
B,50,24,H,"1FC00007FFFF00001FC0" ¦
D,0,4,4 ¦
B,51,24,H,"1C03FFFFFFFFFFE01C0" ¦
D,0,4,4 ¦
B,52,32,H,"3FFFFFFFFFFFFE1C0" ¦
D,0,4,4 ¦
B,53,24,H,"03FFF0000000007FFE" ¦
D,0,4,4 ¦
B,70,0,H,"0400001FC00007FFFF00001FC0" ¦
B,71,0,H,"0600001C03FFFFFFFFFFE01C0" ¦
B,72,0,H,"030000003FFFFFFFFFFFFE1C0" ¦
B,73,0,H,"01000003FFF0000000007FFE" ¦
B,74,8,H,"FC001C03FFFFFFFFFFE00C0" ¦
B,75,8,H,"FE00003FFFFFFFFFFFFE0C0" ¦
B,76,8,H,"1FF803FFF0000000007FFE" ¦
B,77,8,H,"0FFFCFFC00000000000001C0" ¦
B,78,16,H,"FFDF000FFFFFFFFF8003C0" ¦
B,79,16,H,"7FFFC00007FFFF00001FC0" ¦
B,80,24,H,"1C03FFFFFFFFFFE01C0" ¦
D,0,4,4 ¦
B,81,32,H,"3FFFFFFFFFFFFE1C0" ¦
D,0,4,4 ¦
B,82,24,H,"03FFF0000000007FFE" ¦
D,0,4,3 ¦
B,83,24,H,"1FC00007FFFF00001FC0" ¦
D,0,4,3 ¦
B,98,24,H,"03FFFFFFFFFFFFFF0" ¦
B,99,24,H,"07FFFFFFFFFFFFFFC" ¦
B,100,24,H,"1FF9FFFFFFFFFFFF" ¦
B,101,24,H,"3FFE0007FFFF8000FF80" ¦
B,102,24,H,"391E0027FFFF803FFFC0" ¦
B,103,24,H,"1C7FFFFFFFFFFFFFFC0" ¦
B,104,24,H,"1FC1FFFFFFFFFFF1FC0" ¦
B,105,24,H,"0FFDFFFFFFFFFFE0FF" ¦
B,106,24,H,"FFFFFFFFFFFFFFF8" ¦
```

```
B,107,32,H,"3FFFFFFFFFFFFE0" ¦
B,108,32,H,"03FFFFFFFFFFF" ¦
B,109,48,H,"07FFFF80" ¦
D,0,1,2 ¦
B,111,48,H,"FFFFFFFF" ¦
B,112,32,H,"FFFF00000000FFE0" ¦
B,113,24,H,"078000FFFFFFFF001F" ¦
B,114,24,H,"78FFFFFFFFFFFFFE060" ¦
B,115,16,H,"0187FFFFFFFFFFFFFFC18" ¦
B,116,16,H,"027FFFFFFFFFFFFFFFFF2" ¦
B,117,16,H,"03FFFFFFFFFFFFFFFFFC" ¦
D,0,1,2 ¦
B,120,16,H,"01FFFFFFFFFFFFFFFFF8" ¦
B,121,24,H,"FEFFFFFFFFFFFFFFFE0" ¦
B,122,24,H,"07FFFFFFFFFFFFFFC" ¦
B,123,32,H,"FFFFFFFFFFFFFFC0" ¦
B,124,32,H,"01FFFFFFFFFF8" ¦ }
```

Sample Run Length Graphic Packet

```
{G,99,A,R,G,0,0,0,"99WIRE" ¦
B,39,50,R,"Z" ¦
B,40,39,R,"KzI" ¦
B,41,34,R,"EzsF" ¦
B,42,30,R,"DpZoD" ¦
B,43,25,R,"EdZZEdE" ¦
B,44,23,R,"BeZZMeB" ¦
B,45,23,R,"BcZZW" ¦
B,46,23,R,"ZZZA" ¦
B,47,23,R,"ZDsZE" ¦
B,48,24,"TzkU" ¦
B,49,25,"HtRqJ" ¦
B,50,27,"GsSsG" ¦
D,0,4,4 ¦
B,51,27,"ChZWgC" ¦
D,0,4,4 ¦
B,52,34,R,"ZZEdC" ¦
D,0,4,4 ¦
B,53,30,R,"NzkN" ¦
D,0,4,4 ¦
B,70,5,R,"AuGsSsG" ¦
B,71,5,R,"BtChZWgC" ¦
B,72,6,R,"DxZZEdC" ¦
B,73,7,R,"CtNzkN" ¦
B,74,8,R,"FmChZWhC" ¦
B,75,8,R,"GsZZEdC" ¦
B,76,11,R,"JiNzkN" ¦
B,77,12,R,"NbJzzeC" ¦
```



```
B,78,16,R,"JaElZKmD" ¦
B,79,17,R,"QsSsG" ¦
B,80,27,R,"ChZWgC" ¦
D,0,4,4 ¦
B,81,34,R,"ZZEdC" ¦
D,0,4,4 ¦
B,82,30,R,"NzkN" ¦
D,0,4,4 ¦
B,83,27,R,"GsSsG" ¦
D,0,4,4 ¦
B,98,30,R,"ZZJ" ¦
B,99,29,R,"ZZM" ¦
B,100,27,R,"JbZZE" ¦
B,101,26,R,"MnToI" ¦
B,102,26,R,"CbHnTiP" ¦
B,103,27,R,"CcZZC" ¦
B,104,27,R,"GeZWcG" ¦
B,105,28,R,"JaZReH" ¦
B,106,32,R,"ZZI" ¦
B,107,34,R,"ZZE" ¦
B,108,38,R,"ZQ"¦
B,109,53,R,"T" ¦
D,0,1,2 ¦
B,111,48,R,"ZF" ¦
B,112,33,R,"PzfK" ¦
B,113,29,R,"CpZBoE" ¦
B,114,25,R,"DcZZGfB" ¦
B,115,23,R,"BdZZMeB" ¦
B,116,22,R,"AbZZVbA" ¦
B,117,22,R,"ZZZB" ¦
D,0,1,2 ¦
B,120,23,R,"ZZZ" ¦
B,121,25,R,"ZZV" ¦
B,122,29,R,"ZZM" ¦
B,123,32,R,"ZZF" ¦
B,124,39,R,"ZT" ¦ }
```

Placing the Graphic in a Format

To include a graphic within a format:

1. Design the graphic image as shown in "Designing Bitmapped Images."
2. If you are using RAM, place a graphic field in the format file to reference the graphic. See the following section, "Defining the Graphic Field," for more information.

If you are using temporary storage, you do not need a graphic field in your format to reference the graphic image.

---

3. Download all the necessary packets (check digit, format, etc.).
4. Send the graphic file to the printer, if you have not already done so. See "Creating a Graphic Packet" for more information.

Defining the Graphic Field

The graphic field in a format references the graphic image by the graphID in the graphic header.

This field is required only if the graphic will be stored in RAM.

Syntax **`G,graphID,row,col,mode,rotation ¦`**

G1. G Graphic Field.

G2. graphID Unique number from 0 to 999 to identify the graphic image.

G3. row Distance between the bottom of the print area on the supply to the bottom of the graphic image. Measured in selected units.

English	0 - 365
Metric	0 - 927
Dot	0 - 701

The row specified in the constant text, bitmap, line, or box field is added to the row value above to determine the actual position in the format.

G4. column Distance between the left edge of the print area on the supply and the left edge of the graphic. Measured in selected units.

English	0 - 183
Metric	0 - 465
Dot	0 - 352

The column specified in the constant text, bitmap, line, or box field is added to the col value above to determine the actual position in the format.

G5. mode Imaging mode. Enter 0.

G6. rotation The orientation of the graphic on the supply. Enter 0.

Example

```
G,57,0,0,0,0 ¦
```

Defines a graphic field that is identified by the number 57. The image begins at 0,0. The imaging mode is 0 and there is no rotation.

Sample Bitmap Graphic Image

The following format shows the graphic packets (hex and run length) in a sample format.

```
{F,2,A,R,E,200,200,"FMT2"| ¦
G,99,132,30,0,0 ¦
Q,146,30,198,95,5,""  ¦
T,1,5,V,175,100,0,1004,1,1,B,L,0,0,0 ¦
T,2,5,V,150,100,0,1004,1,1,B,L,0,0,0 ¦
T,3,15,V,120,25,0,1003,1,1,B,L,0,0,0 ¦
T,4,15,V,95,35,0,1003,1,1,B,L,0,0,0 ¦
L,S,84,15,84,195,10," " ¦
B,5,12,F,30,65,1,2,40,1,L,0 ¦
}
```

TROUBLESHOOTING

7

This chapter explains how to reset the printer, call Technical Support, and gives explanations of your printer's errors. The errors are classified by type and are listed in order. Call Technical Support if you receive any error message not listed in this chapter.

If you have trouble loading supplies or performing maintenance, refer to your *Operator's Handbook*.

Troubleshooting Information

If you experience problems using your printer, refer to this section.

If You Receive an Error Message

Any time you receive a message that is not described in this manual, or the recommended action does not solve the problem, call Technical Support.

Calling Technical Support

Technical support representatives are available Monday through Friday during regular business hours at 1-800-543-6650. Follow these steps before you call:

1. Make sure your PC and printer are properly connected.
2. Record any error messages that occurred.
3. Try to recreate the problem, if you can.
4. Check your port settings. Your problem may corrected simply by changing the communication settings.
5. List any changes that have recently been made to the system. Try to record what you did when the problem occurred.
6. Reset your printer. For information on resetting your printer, see "Resetting Printers."
7. Reboot your computer. Refer to your computer documentation for specific instructions.

If these steps do not solve the problem, call Technical Support.

Have the following information ready before you call:

- computer brand name and model
- version of DOS
- Monarch printer model
- other peripheral devices on your system
- support agreement, contract number, or invoice information
- customer number
- printer serial number

Data Errors

Errors 001 to 499 are data errors. A data error indicates that incorrect data was received from the host, causing the printer to ignore the entire print job. After checking the packet and correcting the problem, transmit the print job again.

The following is a list of data errors. These errors occur because data in the format, batch, check digit, font, or graphic packet is invalid.

Format Errors (1 - 99)

Error Code	Description
001	Format ID number must be **1** to **99**.
002	Name must be **1** to **8** characters inside quotes or a printer-assigned name ("").
003	Action must be **A** (add) or **C** (clear).
004	Supply length is invalid (maximum is 4"). See "Defining the Format Header" in Chapter 3 for valid lengths.
005	Supply width is invalid (maximum is 2"). See "Defining the Format Header" in Chapter 3 for valid widths.

006 Storage device must be **R** (volatile RAM).

007 Unit of measure must be **E** (English), **M** (Metric), or **G** (Dots). See "Defining the Format Header" in Chapter 3 for information.

010 Field ID number is outside the range **0** to **999**.

011 Field length exceeds **2710**.

012 Row field position is greater than the maximum stock dimension. See "Defining Text Fields" in Chapter 3 for valid row lengths.

013 Column field position is greater than the maximum stock dimension. See "Defining Text Fields" in Chapter 3 for valid column widths.

014 Font style is invalid. See "Defining Text Fields" in Chapter 3 or Appendix B, "Fonts," for more information.

015 Character rotation must be **0** (0 degree), **1** (90 degree), **2** (180 degree), or **3** (270 degree). See "Defining Text Fields" in Chapter 3 for information.

016 Field rotation must be **0** (0 degree), **1** (90 degree), **2** (180 degree), or **3** (270 degree). See "Defining Text Fields" in Chapter 3 for information.

017 Field restriction must be **V** (variable) or **F** (fixed).

018 Code page selection defined in the field must be **1** (ASCII).

020 Vertical magnification must be **1** to **7**.

021 Horizontal magnification must be **1** to **7**.

022 Color must be **B**, **D**, **O**, **R**, or **W**. See "Defining Text Fields" in Chapter 3 for more information.

023 Intercharacter gap must be **0** to **99** dots.

024 Field justification must be **B** (balanced), **C** (centered), **E** (end), **L** (left), or **R** (right). See "Defining Text Fields" in Chapter 3 for more information.

025 Data length is too long.

030 Bar code height must be at least **1** (English), **2** (Metric), **1** (Dots), or is not within the supply dimensions.

031 Human readable option must be
1 no CD or NS
5 NS at bottom, no CD
6 CD at bottom, no NS
7 CD and NS at bottom
8 no text

032 Bar code type is invalid. See "Defining Bar Code Fields" in Chapter 3 for valid options.

033 Bar code density is invalid. See "Defining Bar Code Fields" in Chapter 3 for the bar code density chart.

040 Line thickness must be **0** to **99** dots.

041 Line direction must be **0**, **90**, **180**, or **270**.

042 End row is invalid. Line segment or box end row is defined outside of printable area.

043 End column is invalid. Line segment or box end column is defined outside of printable area.

044 Dot pattern for line or box must be "".

045 Line length is defined beyond the maximum length of 3.72". See "Defining Line Fields" in Chapter 3 for valid lengths.

046 Line type must be **S** (segment) or **V** (vector).

051 Imaging mode in the graphic header must be **0**.

Batch Errors (100 - 199)

Error Code	Description
101	The format referenced by batch is not in memory.
102	Print quantity is outside the range **0** to **25**.
104	Batch mode must be **N** (new) or **U** (update).
105	Batch separator in a batch control field must be **0** (Off).
106	Print multiple is not **1**.
108	Multiple part supply is outside the range **1** to **5**.

Rule Errors (200 - 249)

Error Code	Description
200	Option number must be **1**, **4, 31**, **50**, **51**, **or 52**.
201	Copy length is outside the range **0** to **255**.
202	Copy start position must be **1** to **255**.
203	Destination start position must be **1** to **255**.
204	Source field must be **0** to **999**.
205	Copy type must be **1** (copy after rules) or **2** (copy before rules).
210	Security value for a PDF417 bar code must be **0** to **8**. Correct the value and resend the format to the printer.
211	Narrow element value is less than **1** or greater than **99**. Correct the value and resend the format to the printer.

212 Wide element value is less than **1** or greater than **99**. Correct the value and resend the format to the printer.

213 Dimension must be **1** to **30** for a column or **3** to **90** for a row on a PDF417 bar code.

214 Truncation code must be **S** (standard) or **T** (truncated bar code).

215 Aspect code must be **C** (columns) or **R** (rows).

216 Option definition must be **S** (set) or **T** (template).

217 Input device must be **D** (Default), **H** (Host), **K** (Keyboard), **N** (None), or **S** (Scanner).

220 Check digit selection must be **G** to generate check digit.

221 Primary or secondary price format is outside the range **1** to **15**.

222 Data type restriction is outside the range of **1** to **6**.

223 Option is not valid for the field.

224 Bar code Intercharacter gap must be **0** to **99** dots. (This is also known as the additional character gap when using Option 50, Defining Bar Code Densities.)

Online Configuration Errors (250 - 299)

Error Code	Description
251	Power up mode must be **0** (online).
252	Language selection must be **0** (English) or **4** (other).
253	Batch separator code in a supply setup packet must be **0** (off).
254	Slash zero selection must be **0** (standard zero).
255	Supply type must be **0** (black mark) or **1** (die cut).
256	Ribbon selection must be **0** (direct) or **1** (transfer).
257	Feed mode must be **0** (continuous) or **1** (on-demand).
258	Supply position is outside the range.
259	Contrast adjustment must be **-390** to **156** dots.
260	Print adjustment must be **-99** to **99** dots.
261	Margin adjustment must be **-99** to **99** dots.
262	Speed adjustment must be **0** (1.0 IPS).
263	Primary monetary symbol is invalid.
264	Secondary symbol selection must be **0** (none) or **1** (print secondary sign).
265	Monetary decimal places must be **0** to **3**.
272	Internal code page selection must be **1** (ASCII).
273	Cut adjustment must be **-99** to **99** dots.
282	RS232 Trailer string is too long. Use a maximum of **3** characters.

283 ENQ Trailer string is too long. Use a maximum of **3** characters.

284 The buffer type must be **T** (Transmit), **R** (Receive), **I** (Image), **F** (Format), or **D** (Downloadable Fonts).

285 The storage device type in the memory configuration packet must be **R** (volatile RAM).

286 The buffer size is invalid.

287 The printhead width must be **244** to **812** dots.

288 The battery voltage must be **0** (15-volt battery) or **1** (12-volt battery).

289 The printer address specified in the communication settings packet must use *exactly* six characters.

Check Digit Errors (300 - 324)

Error Code	Description
310	Check digit scheme number must be **1** to **10**.
311	Modulus must be **2** to **11**.
314	Check digit algorithm must be **D** (sum of digits) or **P** (sum of products).

Graphic Errors (325 - 399)

Error Code	Description
325	Duplicating direction must be **0** (insert after) or **1** (insert before) in duplicate fields for graphics.
327	Amount of row adjustment must be **0** to **999** dots in duplicate fields for graphics.

328	Duplicate count must be **0** to **999**.
340	Bitmap line encoding must be **H** (hex) or **R** (run length).
350	Font selector must be **1** to **9999**.
351	Font data length must be **68** to **16384**.
352	Insufficient font memory is available for the downloaded font.
360	Prompt name is invalid.
362	Prompt number is invalid.
363	Prompt string is invalid.

General Packet Errors (300 - 324)

Error Code	Description
400	The character immediately following **{** is invalid.
401	Internal data error. Call Technical Support.
402	Field separator is not in the expected location.
403	Field separator was not found.
404	The number or string that is currently being processed is too long.
405	Too many fields exist in the format. You cannot have more than **50** fields in the format. Lines, boxes, and constant text fields count as fields.
406	Packet is incomplete, attempted to delete or overwrite a format used by the current batch, or attempted to load a graphic while the printer was busy.
407	Parser timed out- no data. Resend packet to the printer.

408	No data. Resend packet to the printer.
409	The printer memory is full. Delete unnecessary formats or graphics from memory. If you are using a graphic file that is very large, consider using another mapping method (such as run length encoding) to reduce the required memory.
415	The buffer size you defined exceeds the total available in your machine.
420	Internal software error relating to list sync. Call Technical Support.
421	Internal software error relating to location name. Call Technical Support.
422	Internal software error relating to duplicate name. Call Technical Support.
423	Internal mailbox error. Call Technical Support.
424	Item in use. Call Technical Support.
425	Item already checked out. Call Technical Support.
426	Item not checked out. Call Technical Support.
427	Format name is invalid. Valid name is **1 - 8** characters inside quotes or "" for a printer-assigned name. If the error reappears, call Technical Support.

428 Batch name is invalid or graphic not found. If the error reappears, call Technical Support.

429 A field number appears more than once in a format.

430 The format uses a graphic file that cannot be found.

431 The format file cannot be found.

432 The graphic file cannot be found.

433 The batch references a field number that does not exist in the format.

434 Internal software error caused by a downloaded task that is not executable. Turn off the printer. Wait two seconds and turn it back on. If the error persists, call Technical Support.

435 Internal software error caused by a downloaded task that already exists. Turn off the printer. Wait two seconds and turn it back on. If the error persists, call Technical Support.

Data Formatting Failures

Formatting errors indicate that a field will print incorrectly. After you have checked the data stream and corrected the data, retransmit the format and batch.

For errors 571-619, the batch will still print, but the field, font, bar code, or density may be incomplete, missing or contain incorrect data.

571 UPC or EAN bar code data length is invalid. The bar code data length in the batch does not fit the format.

573 Price field length is invalid. The price field length in the batch does not fit the format or the field contains blanks.

574 No CD scheme or room for CD. The CD scheme in the batch does not fit the format or the field contains blanks.

575 The graphic included in your format could not be found.

580 Out of memory. Try to reallocate memory. Resend the packet. If the error persists, call Technical Support.

603 Internal software error caused by the batch not being held. Turn off the printer. Wait two seconds and turn it back on. If the error persists, call Technical Support.

611 Font, bar code or density is invalid. The font, bar code or density in the batch does not fit the format.

612 The data in this line of the batch is either missing or does not match the format.

613 Reference point off tag.

614 Portion of field off tag. There may be an invalid character in the packet. Make sure you did not enter **O** for **Ø**.

615 Bar code width is greater than 16 inches or the number of keywords for your PDF 417 bar code exceeds **928**. Decrease the density or shorten the amount of data to print the bar code.

616 Dot shifting failed. A bad dot falls on a bar code that cannot be shifted. Call Technical Support.

618 Magnification must be **1** to **7**.

Machine Faults

Errors 700 to 799 occur when there is a problem with the printer.

703 The printer sensed a calibration of different-sized black marks. Make sure the correct supply is loaded.

704 Printer has not sensed a supply mark within the specified number of inches or out of supplies. Check the supply tracking

- ✦ supply marks
- ✦ black mark sensor position
- ✦ supply roll for binding.

If the error continues to appear, change the supply.

730 A memory allocation error occured during initialization.

750 Printhead is overheated. Turn off the printer to let the printhead cool. If the error persists, call Technical Support.

751 Printer did not sense a black mark when expected. The supply may be jammed.

For errors 751-753, Check the

- ✦ supply tracking
- ✦ supply marks
- ✦ black mark sensor position
- ✦ supply roll for binding.

If the error continues to appear, change the supply.

752 Printer sensed a mark in the wrong place.

753 Printer sensed a mark that is too long.

755 Printhead is open. Close the printhead before continuing. If the error persists, call Technical Support.

756 The printer is out of supplies. Load supplies.

757 Load supplies. The calibrated supply length differs by plus or minus .25 inches from the format.

758 Check supply. Either the On-Demand sensor is broken, or the supply is not seen. Adjust the On-Demand sensor so it is over a white area on the supply, or set the unit to continuous mode.

762 Low battery. Recharge the battery.

763 Waiting to dispense label. Press the trigger.

765 Printhead failure. You need a new printhead. Call Technical Support.

770 The print motor is not ready. Call Technical Support.

771 The format specified by the application was not found. Reload your application and format, and try again. If the problem continues, call Technical Support.

790 The printer is busy. Turn off the printer. Wait two seconds and turn it back on. Resend the packets. If the problem continues, call Technical Support.

791 The printer has an error pending. Turn off the printer. Wait two seconds and turn it back on. Resend the packets. If the problem continues, call Technical Support.

792 The printer is not initialized. Call Technical Support.

793 The printer job queue is full. Turn off the printer. Wait two seconds and turn it back on. Resend the packets. If the problem continues, call Technical Support.

Errors numbered 900-999 are hard printer failures. Call Technical Support if you receive these messages.

PRINTER OPTIMIZATION 8

This appendix provides information on how to improve your printer's performance by

- adjusting the print quality.
- reducing the imaging time for printing.
- providing general tips and hints for designing formats.

This printer uses "smart imaging" to image and print fields on supplies. Smart imaging remembers the exact boundaries and locations of each field and places a boundary box (white space) around each field. When a field changes that particular boundary box is cleared and the new field data is imaged. However, the new field data may require a larger boundary box than the previous field did. In some cases, neighboring fields that do not change may be covered with white space from the changing field's boundary box.

Adjusting the Print Quality

Many factors affect print quality: type of supplies, print contrast, and the type of printer's application. The type of supply should match the printer's application.

- Using premium supplies reduces smudged images, hard to read labels, and faded print. Supply type, print speed, and print contrast work together to improve the print quality of labels. Contact your Monarch Representative for more information.
- If the print quality is too light or too dark, adjust the print contrast. The correct contrast setting is important because it effects how well your bar codes scan and how long the printhead lasts.

  Be sure to check the print quality of bar codes with a bar code verifier or scanner. If you do not have a verifier or scanner, check the bar code visually. A bar code that is **IN SPEC** will have complete bars and clear spaces. Small alphanumeric characters will look complete. A bar code that is **IN SPEC** may not look as good as one that is too dark, but it will have the highest scan rate.

For highest scan rates, make sure there is adequate white space before and after the bar code. Also, a darker bar code does not mean it will scan better.

Reducing Imaging Time

Imaging time is the time it takes the printer to image the data for the first label after the printer receives the format and batch packet. There are several ways to reduce the imaging time: send formats and configurations once, use a batch quantity of zero, or update batch fields.

- If the formats use the same check digit scheme, you only need to send the check digit scheme once.
- Send formats once and use the batch update field to change information on the label. Using a batch update field reduces the imaging time, because only the fields that change are imaged. All other fields remain the same as the last queued batch.
- Use the batch quantity zero method when your application requires operator intervention to enter data. While the operator is entering data, the previous field is sent with a batch quantity of zero. The printer images the field, but does not print it. After the operator enters the data for the last field, the batch quantity can be specified. The last remaining field is imaged, and the label prints almost immediately.

To pre-image a label:

1. Send the format and a batch header in one file. The first time you send the batch header, use the parameter **N** (new batch), and the parameter **0** for (zero quantity).

Example

```
{B,1,N,0 ¦ }
```

The printer images constant text, line, box, and graphic fields, but does not print them.

2. Input data for each field, and send it with a batch header using the parameter **U** (update) and a quantity of zero. When the printer receives the data, it immediately images the field, but does not print it.

Example

```
{B,1,U,0 ¦
1,"RODGER DIST CTR" ¦ }
{B,1,U,0 ¦
2,"8292" ¦ }
```

At this time, the printer is imaging all associated fields, including fields that copy from other fields.

3. Repeat step 2 for each field except the last one.

```
{B,1,U,0 ¦
3,"BROADWAY" ¦ }
{B,1,U,0 ¦
4,"555 WEST OAK AVE." ¦ }
```

4. For the last field, input data and send it with the quantity of labels you want printed. When the printer receives input for the last field, it immediately prints the labels.

Example

```
{B,1,U,10 ¦
5,"DAYTON, OHIO" ¦ }
```

Increasing Throughput

Reducing the imaging time increases throughput. You can also increase the baud rate to increase the transmission time and increase throughput. Make sure the communication settings at the printer match those at the host.

General Format Tips and Hints

The following tips and hints are helpful to keep in mind when designing MPCLII formats.

With Formats

If you want to modify your format fields, check digit fields, and configuration commands, use the optional entry method. This method enables you to reset only the parameters you want to change. Commas act as placeholders for unchanged parameters. The optional entry method reduces file size and increases the speed at which files are sent to the printer.

With Packets

Leave parameters blank that you do not need to change when sending online configuration packets.

You can group fields with similar parameters. For example

```
T,1,10,V,250,50,1,1,1,1,B,C,0,0 ¦
T,2,15,,,75 ¦
T,3,,,,100 ¦
```

The first text field sets all the parameters for that field. The second text field's number of characters and column location changes from what was defined in the first field. In the third text field, only the column location is changed. This method can be used on bar code and constant text fields as well.

You should understand the basics of each field before using this method.

After you modify any fields or parameters with the optional entry method, resend the format, batch, or configuration packet to the printer.

With Bar Codes

Be careful when rotating or placing a UPC/EAN bar code with human readable characters, because the bottom reference point is at the bottom of the bars, **not** at the bottom of the human readable characters.

With Fields

Data that remains the same for each label should be in a constant text field. Data that varies for each label should be in a text field.

Check for trailing spaces in text or constant text fields if you receive a "field off tag" error. An easy way to see trailing spaces is to print the field in the reverse font.

Make sure if you magnify a field, it does not go off the label or cover another field. Magnifying a field increases the distance between the printed character and the edge of the cell.

SAMPLES

A

This appendix contains sample formats. You can customize any of these formats to meet your needs.

Sample UPCA Format Packet

```
{F,25,A,R,M,508,508,"Fmt 25" ¦
C,250,80,0,1,2,1,W,C,0,0,"MONARCH MARKING" ¦
B,1,12,F,110,115,1,2,120,5,L,0 ¦
T,2,18,V,30,30,1,1,1,1,B,C,0,0 ¦ }
```

Sample Batch Packet

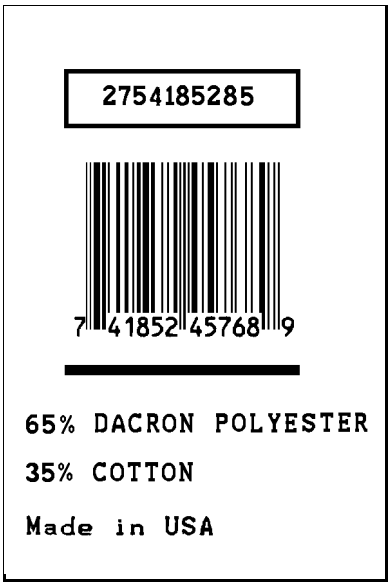
```
{B,25,N,1 ¦
1,"12345678901" ¦
2,"DAYTON, OHIO" ¦ }
```

Sample Fixed Character Format Packet

```
{F,1,A,R,E,300,200,"TEXTILES" ¦
T,1,10,V,250,50,0,1,1,1,B,C,0,0,0 ¦
B,2,12,V,150,40,1,2,80,7,L,0 ¦
D,3,3 ¦
D,4,20 ¦
T,5,25,V,80,10,0,1,1,1,B,L,0,0,0 ¦
R,1,"   %                    " ¦
R,4,3,1,3,1,1 ¦
R,4,4,1,20,6,1 ¦
D,6,3 ¦
D,7,20 ¦
T,8,25,V,65,10,0,1,1,1,B,L,0,0,0 ¦
R,1,"   %                    " ¦
R,4,6,1,3,1,1 ¦
R,4,7,1,20,6,1 ¦
C,30,10,0,1,1,1,B,L,0,0,"MADE IN USA",0 ¦
L,S,110,30,110,150,10," " ¦
Q,240,30,270,150,3," " ¦ }
```

Sample Batch Packet

```
{B,1,N,1 ¦
1,"2754185285" ¦
2,"74185245768" ¦
3,"65" ¦
4,"DACRON POLYESTER" ¦
6,"35" ¦
7,"COTTON" ¦ }
```



FONTS

B

This appendix contains information you need to work with fonts.

Standard Fonts

Your printer comes with these downloadable fonts:

Number	Font Size and Appearance	Type of Spacing	# of Dots Between Characters
1000	CG Triumvirate Bold 6.5 pt	proportional	varies w/each letter
1001	CG Triumvirate Bold 8 pt	proportional	varies w/each letter
1002	CG Triumvirate Bold 10 pt	proportional	varies w/each letter
1003	CG Triumvirate Bold 12 pt	proportional	varies w/each letter
1004	CG Triumvirate Bold 18 pt	proportional	varies w/each letter
1005	CG Triumvirate Bold 22 pt	proportional	varies w/each letter
1006	CG Triumvirate Bold Condensed 6.5 pt	proportional	varies w/each letter
1007	CG Triumvirate Bold Condensed 8 pt	proportional	varies w/each letter
1008	CG Triumvirate Bold Condensed 10 pt	proportional	varies w/each letter
1009	CG Triumvirate Bold Condensed 12 pt	proportional	varies w/each letter
1010	CG Triumvirate Bold Condensed 18 pt	proportional	varies w/each letter
1011	CG Triumvirate Bold Condensed 22 pt	proportional	varies w/each letter
1012	Letter Gothic Bold 6 pt	monospaced	1
1013	Letter Gothic Bold 9 pt	monospaced	2

Refer to the following pages for illustrations of these fonts.

Monospaced Font Magnification

Monospaced characters occupy the same amount of space within a magnification. Use monospaced fonts for price fields and data you want to list in a column. Decide how wide and tall you want the characters to appear on the labels. The following two tables show the width and height of each of the monospaced fonts after magnification.

This table includes the default 1 dot for Reduced, 1 dots for Letter Gothic 6 pt, 2 dots for Letter Gothic 9 pt spacing.

Width Mag.		Reduced	Letter Gothic 6 pt	Letter Gothic 9 pt
	Units	Character Width Sample	Character Width Sample	Character Width Sample
1x	1/100 in.	3.9	4.69	7.29
	1/10 mm	9.9	11.91	18.52
	Dots	8	9	14
7x	1/100 in.	24.63	32.81	51.04
	1/10 mm	62.56	83.34	129.65
	Dots	50	63	98

To calculate other font widths, multiply the font dots 7 dots for Reduced by the magnification and add the default spacing 1 dot for Reduced between characters.

Example

7 (Standard font dots) x 5 (magnification) = 35 + 1 (default spacing between characters). There are 36 dots in the Reduced font at 5x.

Height Magnification

Reduced	A	
1/100 in.	6.9	48.28
1/10 mm	17.5	122.6
dots	14	98

Proportional Font Magnification

Each character in a proportionally spaced font is a different height and width. You may be able to place more characters on a line using proportionally spaced fonts. You may want to experiment with these fonts and adjust field measurements in your format as needed. The following tables provide height and width magnification of sample characters.

CG Triumvirate Bold (8 pt.)

Width Mag.		Minimum	Average	Maximum
1x	1/100 in.	1.56	5.73	10.94
	1/10 mm	3.97	14.55	27.78
	Dots	3	11	21
7x	1/100 in.	6.9	20.7	41.4
	1/10 mm	17.5	52.6	105.2
	Dots	14	42	84

To calculate other font widths, multiply the font dots (3 dots for Minimum, 13 dots for Average, 22 dots for Maximum) by the magnification.

Example

13 (Average font dots) x 5 (magnification) = 65 dots in an average letter of the CG Triumvirate Bold font at 5x.

CG Triumvirate Bold (6.5 pt.) Font #1000

Width Mag.		Minimum	Average	Maximum
1x	1/100 in.	1.56	4.69	9.90
	1/10 mm	3.97	11.91	25.14
	Dots	3	9	19
7x	1/100 in.	10.94	32.81	69.27
	1/10 mm	27.78	83.34	175.95
	Dots	21	63	133

Height Magnification

	1x	7x
1/100 in.	6.77	47.40
1/10 mm	17.20	120.39
dots	13	91

CG Triumvirate Bold (8 pt.) Font #1001

Width Mag.		Minimum	Average	Maximum
1x	1/100 in.	1.56	5.73	10.94
	1/10 mm	3.97	14.55	27.78
	Dots	3	11	21
7x	1/100 in.	6.9	20.7	41.4
	1/10 mm	17.5	52.6	105.2
	Dots	14	42	84

Height Magnification

	1x	7x
1/100 in.	8.33	58.33
1/10 mm	21.17	148.17
dots	16	112

CG Triumvirate Bold (10 pt.) Font #1002

Width Mag.		Minimum	Average	Maximum
1x	1/100 in.	1.56	6.77	13.02
	1/10 mm	3.97	17.20	33.07
	Dots	3	13	25
7x	1/100 in.	10.94	47.40	91.15
	1/10 mm	27.78	120.39	231.51
	Dots	21	91	175

I L W

Height Magnification

	1x	7x
1/100 in.	10.42	72.92
1/10 mm	26.46	185.21
dots	20	140

W

CG Triumvirate Bold (12 pt.) Font #1003

Width Mag.		Minimum	Average	Maximum
1x	1/100 in.	2.60	8.85	16.15
	1/10 mm	6.61	22.49	41.01
	Dots	5	17	31
7x	1/100 in.	18.23	67.94	113.02
	1/10 mm	46.30	157.43	287.07
	Dots	35	119	217

Height Magnification

	1x	7x
1/100 in.	12.50	87.50
1/10 mm	31.75	222.25
dots	24	168

CG Triumvirate Bold (18 pt.) Font #1004

Width Mag.		Minimum	Average	Maximum
1x	1/100 in.	7.81	12.50	22.92
	1/10 mm	19.84	31.75	58.21
	Dots	15	24	44
7x	1/100 in.	54.69	87.50	160.42
	1/10 mm	138.91	222.25	407.46
	Dots	105	168	308

Height Magnification

1x **7x**

1/100 in.	19.27	134.90
1/10 mm	48.95	342.64
dots	37	259

CG Triumvirate Bold (22 pt.) Font #1005

Width Mag.		Minimum	Average	Maximum
1x	1/100 in.	9.38	15.63	27.08
	1/10 mm	23.81	39.68	68.79
	Dots	18	30	52
7x	1/100 in.	65.63	109.38	189.58
	1/10 mm	166.69	277.81	481.54
	Dots	126	210	364

Height Magnification

1x **7x**

1/100 in.	23.44	164.05
1/10 mm	59.53	416.72
dots	54	315

CG Triumvirate Bold Cond (6.5 pt.) Font #1006

Width Mag.		Minimum	Average	Maximum
1x	1/100 in.	1.04	3.65	6.25
	1/10 mm	2.65	9.26	15.88
	Dots	2	7	12
7x	1/100 in.	7.29	25.52	43.75
	1/10 mm	18.52	64.82	111.13
	Dots	14	49	84

Height Magnification

	1x	7x
1/100 in.	6.77	47.40
1/10 mm	17.20	120.39
dots	13	91

CG Triumvirate Bold Cond (8 pt.) Font #1007

Width Mag.		Minimum	Average	Maximum
1x	1/100 in.	1.56	4.69	8.85
	1/10 mm	3.97	11.91	22.49
	Dots	3	9	17
7x	1/100 in.	10.94	32.81	67.94
	1/10 mm	27.78	83.34	157.43
	Dots	21	63	119

Height Magnification

	1x	7x
1/100 in.	8.85	61.98
1/10 mm	22.49	157.43
dots	17	119

CG Triumvirate Bold Cond (10 pt.) Font #1008

Width Mag.		Minimum	Average	Maximum
1x	1/100 in.	2.08	5.73	11.98
	1/10 mm	5.29	14.55	30.43
	Dots	4	11	23
7x	1/100 in.	14.58	40.10	83.85
	1/10 mm	37.04	101.86	212.99
	Dots	28	77	161

Height Magnification

	1x	7x
1/100 in.	10.94	76.56
1/10 mm	27.78	194.47
dots	21	147

CG Triumvirate Bold Cond (12 pt.) Font #1009

Width Mag.		Minimum	Average	Maximum
1x	1/100 in.	2.60	7.29	14.58
	1/10 mm	6.61	18.52	38.04
	Dots	5 I	14 L	28 W
7x	1/100 in.	18.23	51.04	96.88
	1/10 mm	46.30	129.65	246.06
	Dots	35	98	186

Height Magnification

	1x W	7x
1/100 in.	13.02	91.15
1/10 mm	33.07	231.51
dots	25	175

CG Triumvirate Bold Cond (18 pt.) Font #1010

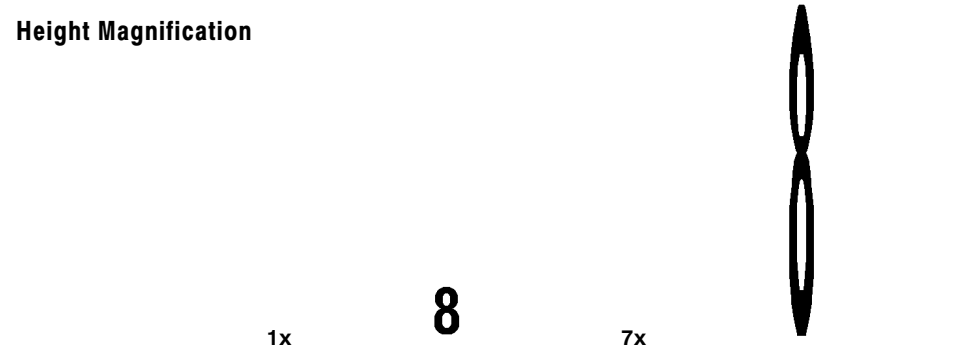
Width Mag.		Minimum	Average	Maximum
1x	1/100 in.	7.81	10.94	21.88
	1/10 mm	19.84	27.78	55.56
	Dots	15	21	42
7x	1/100 in.	54.69	76.56	153.12
	1/10 mm	138.91	194.47	388.94
	Dots	105	147	294

Height Magnification

1/100 in.	20.31	142.19
1/10 mm	51.59	361.16
dots	39	273

CG Triumvirate Bold Cond (22 pt.) Font #1011

Width Mag.		Minimum	Average	Maximum
1x	1/100 in.	9.38	13.02	26.56
	1/10 mm	23.81	33.07	67.47
	Dots	18	25	51
7x	1/100 in.	65.63	91.15	185.94
	1/10 mm	166.69	231.51	472.28
	Dots	126	175	357



Height Magnification

1/100 in.	24.48	171.35
1/10 mm	62.18	435.24
dots	47	329

Using Font Numbers in Formats

Use the following font numbers in your format when designating new fonts.

1 - 49	Resident fonts (bitmapped only)
50 - 99	Resident fonts (scalable only)
100 - 499	Customer-generated RAM fonts (bitmapped)
500 - 999	Monarch's optional ROM fonts (bitmapped and scalable)
1000 - 8999	Monarch's optional RAM fonts (bitmapped)
9000 - 9999	Monarch's optional RAM fonts (scalable only)

If you use a font number that is not a standard font for your printer, make sure the font has been installed in the printer.

Locating the Font Number in a Font Packet

If you are creating font packets, the font number is the second parameter in the packet. Software is available to create the font data and packet. Call Technical Support for more information.

Example

```
{W,200,A,N,68 ¦
font data ¦
font data ¦ }
```

Use this number in **T8** or in **C5**. See "Defining Text Fields" or "Defining Constant Text Fields" in Chapter 4 for more information.

Example

```
T,1,10,V,30,10,0,200,1,1,B,L,0,0,0 ¦
C,50,30,0,200,1,1,B,L,0,0,"MONARCH",0 ¦
```

Defines a text and constant text field using the downloaded (#200) font.

SYMBOL SETS/CODE PAGES C

This appendix provides a listing of the symbol sets and code pages the printer supports.

Supported Symbol Sets and Code Pages

The printers support these symbol sets and code pages:

- Internal Symbol Set
- ASCII Symbol Set
- DOS Code Page 437
- DOS Code Page 850

Fonts 1004, 1005, 1010, and 1011 are limited to the following special characters:
0123456789#$%&(),./@DFKLMPS\kprö£¥.

Selecting a Symbol Set or Code Page

The printer defaults to the internal symbol set.

Selecting the Internal Symbol Set

The CG Triumvirate fonts support only the ASCII and DOS Code Page Symbol Sets.

Selecting the 437 Code Page

This code page provides extended and international characters and uses proportionally spaced fonts for the screen display.

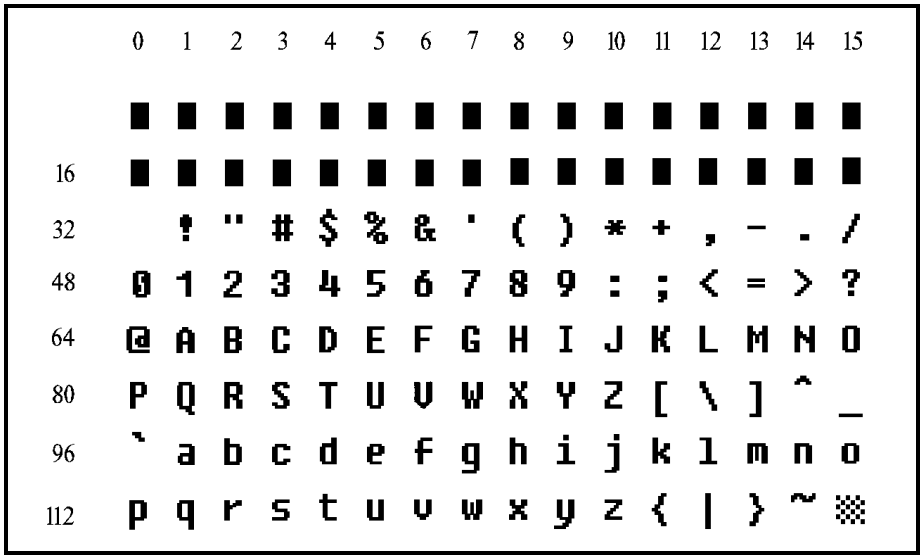
Using Code 128 Function Codes

This table lists the characters for Bar Code 128 function codes. These functions are used with scanners.

Code	Function Code
~201	F1
~202	F2
~203	F3
~204	F4

ASCII Symbol Set

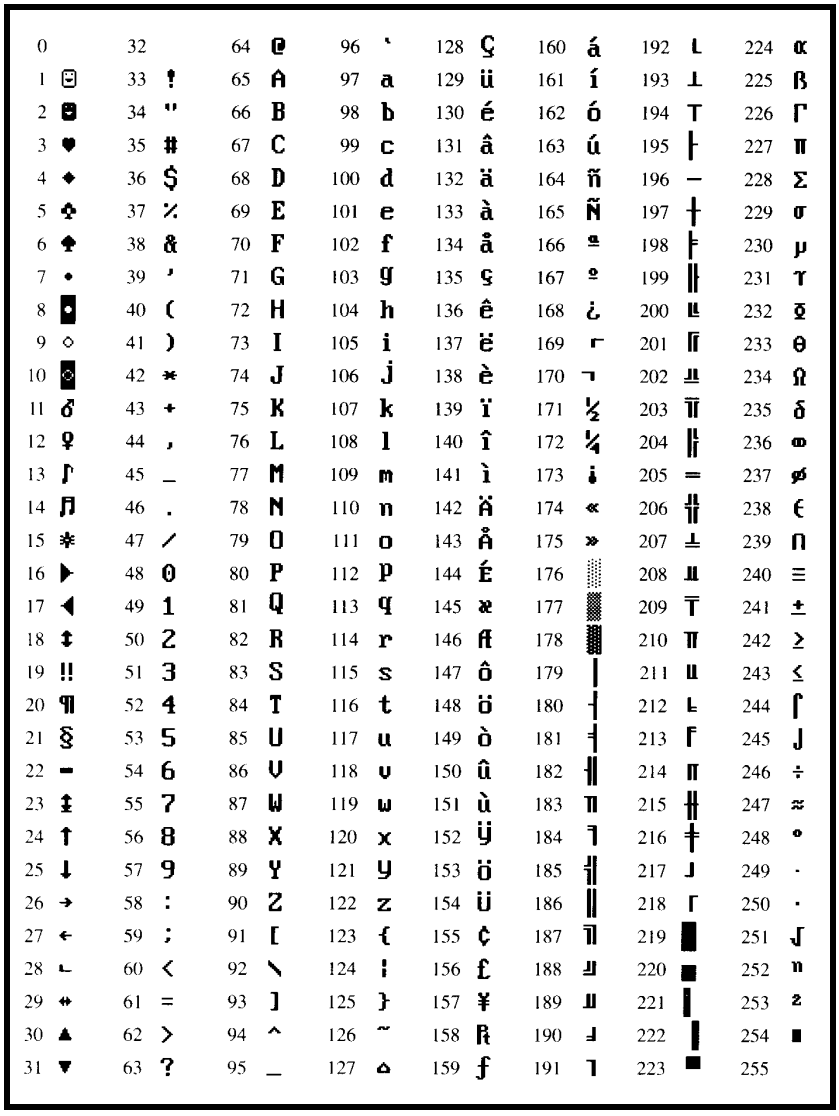
To determine the character code, add the column number and row number for the character. For example, to produce the ~ character, you would press **Alt 226** (column 14 + row 112).



	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
16	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
32		!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
48	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
64	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
80	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
96	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
112	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	▒

■ designates non-printing characters.

Code Page 437



0		32		64	@	96	`	128	Ç	160	á	192	└	224	α
1	☺	33	!	65	A	97	a	129	ü	161	í	193	┴	225	ß
2	☻	34	"	66	B	98	b	130	é	162	ó	194	┬	226	Γ
3	♥	35	#	67	C	99	c	131	â	163	ú	195	├	227	π
4	♦	36	$	68	D	100	d	132	ä	164	ñ	196	─	228	Σ
5	♣	37	%	69	E	101	e	133	à	165	Ñ	197	┼	229	σ
6	♠	38	&	70	F	102	f	134	å	166	ª	198	╞	230	µ
7	•	39	'	71	G	103	g	135	ç	167	º	199	╟	231	τ
8	◘	40	(	72	H	104	h	136	ê	168	¿	200	╚	232	Φ
9	○	41	)	73	I	105	i	137	ë	169	⌐	201	╔	233	Θ
10	◙	42	*	74	J	106	j	138	è	170	¬	202	╩	234	Ω
11	♂	43	+	75	K	107	k	139	ï	171	½	203	╦	235	δ
12	♀	44	,	76	L	108	l	140	î	172	¼	204	╠	236	∞
13	♪	45	-	77	M	109	m	141	ì	173	¡	205	═	237	φ
14	♫	46	.	78	N	110	n	142	Ä	174	«	206	╬	238	ε
15	☼	47	/	79	O	111	o	143	Å	175	»	207	╧	239	∩
16	►	48	0	80	P	112	p	144	É	176	░	208	╨	240	≡
17	◄	49	1	81	Q	113	q	145	æ	177	▒	209	╤	241	±
18	↕	50	2	82	R	114	r	146	Æ	178	▓	210	╥	242	≥
19	‼	51	3	83	S	115	s	147	ô	179	│	211	╙	243	≤
20	¶	52	4	84	T	116	t	148	ö	180	┤	212	╘	244	⌠
21	§	53	5	85	U	117	u	149	ò	181	╡	213	╒	245	⌡
22	▬	54	6	86	V	118	v	150	û	182	╢	214	╓	246	÷
23	↨	55	7	87	W	119	w	151	ù	183	╖	215	╫	247	≈
24	↑	56	8	88	X	120	x	152	ÿ	184	╕	216	╪	248	°
25	↓	57	9	89	Y	121	y	153	Ö	185	╣	217	┘	249	∙
26	→	58	:	90	Z	122	z	154	Ü	186	║	218	┌	250	·
27	←	59	;	91	[	123	{	155	¢	187	╗	219	█	251	√
28	∟	60	<	92	\	124	¦	156	£	188	╝	220	▄	252	n
29	↔	61	=	93	]	125	}	157	¥	189	╜	221	▌	253	2
30	▲	62	>	94	^	126	~	158	₧	190	╛	222	▐	254	■
31	▼	63	?	95	_	127	⌂	159	ƒ	191	┐	223	▀	255	

Dot to Run Length Encoding Chart

ON (Black) Dots

# of Dots	Code	# of Dots	Code
1	A	14	N
2	B	15	O
3	C	16	P
4	D	17	Q
5	E	18	R
6	F	19	S
7	G	20	T
8	H	21	U
9	I	22	V
10	J	23	W
11	K	24	X
12	L	25	Y
13	M	26	Z

OFF (White Dots)

# of Dots	Code	# of Dots	Code
1	a	14	n
2	b	15	o
3	c	16	p
4	d	17	q
5	e	18	r
6	f	19	s
7	g	20	t
8	h	21	u
9	i	22	v
10	j	23	w
11	k	24	x
12	l	25	y
13	m	26	z

FORMAT DESIGN TOOLS

D

Use copies of these worksheets and grids to create formats, batch data, and check digit schemes. You may want to keep copies of the completed forms for your records:

- Batch Worksheet
- Check Digit Worksheet
- Supply Layout Grids (Inches, Metric, Dots)
- Format Worksheet
- Format Sample Worksheet

Batch Worksheet

BATCH HEADER

	B1 HEADER	B2 FORMAT #	B3 NEW / UPDATE	B4 QUANTITY
B				

BATCH CONTROL

	E1 HEADER	E2 FEED-MODE	E3 BATCH-SEP	E4 PRINT-MULT	E5 MULTI-PART	E6 CUT-TYPE	E7 CUT-MULT
E						**0**	**0**

BATCH DATA

FIELD #	DATA
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	

BATCH CONTINUATION

C	DATA
C	
C	
C	
C	
C	
C	
C	
C	
C	
C	
C	
C	
C	
C	

PRINT CONTROL

	HEADER	CONTRAST	PRINT ADJUST	MARGIN ADJUST	SPEED ADJUST	PRINTHD WIDTH
C						

Check Digit Worksheet

A1 HEADER	A2 SELECTOR #	A3 ACTION	A4 DEVICE	A5 MODULUS	A6 LENGTH	A7 ALGORITHM	WEIGHTS A8
A			**R**				

A1 HEADER	A2 SELECTOR #	A3 ACTION	A4 DEVICE	A5 MODULUS	A6 LENGTH	A7 ALGORITHM	WEIGHTS A8
A			**R**				

A1 HEADER	A2 SELECTOR #	A3 ACTION	A4 DEVICE	A5 MODULUS	A6 LENGTH	A7 ALGORITHM	WEIGHTS A8
A			**R**				

GLOSSARY

Batch Data
2,"Monarch"¦
Defines the actual information (as fields within **{ }**) printed on the label.

Batch Control
E,0,1,4,2¦
Defines the print job (as a field).

Batch Header
{B,1,N,1}
First line of a batch, immediately following (**{**). Identifies the format and batch quantity.

Batch Packet
{B,1,N,1¦
2,"Monarch"¦}
Contains a batch header and the batch data. Enclosed within **{ }**.

Bitmapped Fonts
Reside in the printer's RAM or in a ROM chip. If you change the point size, you have changed the font. Magnifying these fonts causes some jaggedness to occur.

Buffer
Storage area in the printer's memory that holds specific data (images, formats, etc).

Field
Can be text, bar codes, lines, boxes, constant, or non-printable text. It is the result of a field definition.

Field Definition
Any string of parameters that pertain to one field. A field definition begins with a field identifier (such as **T**, **B**, **D**, **C**, etc.).

```
T,1,10,V,250,50,0,1,1,1,B,C,0¦
```

Field Parameters
Parameters that apply to a field and are separated by commas. (In the above example, **B** is a field element for Black print on a white background.)

Format
Layout or design for your printed label.

Format Header — First line of a format, immediately following the start of packet (**{**). A format header must begin with **F**, followed by various header elements.

```
{F,1,A,R,E,600,400,"Fmt-1" ¦
```

Monospaced Fonts — All characters have the same width and are easy to center justify. (Standard, bold, and reduced are monospaced.)

Non-volatile RAM (NVRAM) — Contains information that is SAVED on power-down.

Option
R,4,6,1,3,1 ¦ — Any line within a format that applies special formatting to a field. This line always begins with **R** and must immediately follow the field it applies to.

Packet
{B,1,N,1 ¦
2,"Monarch" ¦ } — Any string of characters within (**{ }**).

Pre-image — A way to optimize the printer, because it images the fields while data is collected. After the last field is imaged, the label prints almost immediately.

Proportionally Spaced Fonts — All characters have different widths and are difficult to center justify (CG Triumvirate fonts).

Soft (Downloaded) Fonts — Reside in the printer's RAM. They can be erased or overwritten.

Volatile RAM — Contains information that is LOST on power-down.

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